Welding Engineer

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SEPTEMBER, 1956

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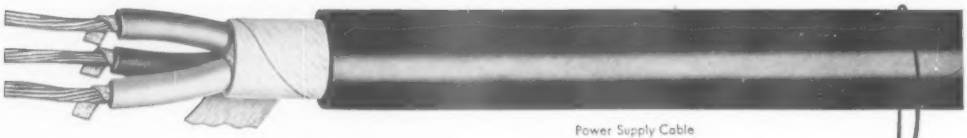

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SINCE 1902
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- ☐ *Send catalog on other types of manual arc welders*

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Address _____

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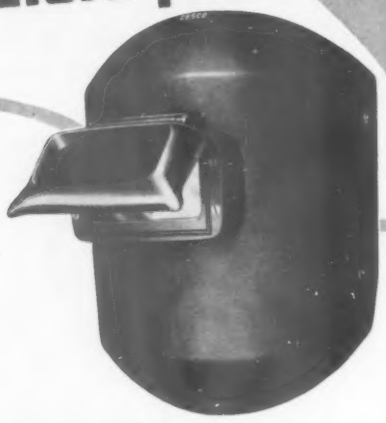

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CESCO **No. 401-2** is a favorite all-purpose helmet. It features the No. 2 lift-front lens holder with shock-absorbing action. Its use permits easy layout and inspection of work. It has every safety and comfort feature of a good welding helmet. The one-piece seamless shell is drawn from hard vulcanized fiber. The chin rest is adjustable as is the form-fitting headgear.

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These new CESCO **Welders Cover Goggles** have been completely redesigned for easy fitting over the larger personal glasses. The increased size gives ample clearance without snagging. The goggles rest entirely outside the eye sockets. They give more comfort with better seal against light flashes. Cups are light, sturdy plastic. Ventilation ports allow circulation without entrance of light.

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CESCO

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Welding Engineer

SEPTEMBER, 1956
VOL. 41—No. 9

THE MAGAZINE OF JOINING
AND SEVERING OF MATERIALS

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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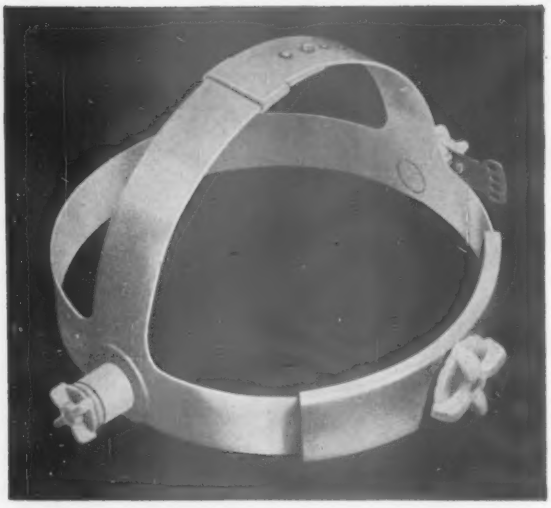

NEW All Nylon Adjust-O-Lok Headgear

Nylon, lightweight and non-conductive, lends its superior, long wearing strength to every part of this completely redesigned arc welding helmet headgear.

The large, easy to handle winged knob and the gear, both of Nylon, engage a Nylon headband to give fine adjustment to head size while helmet is worn. Headband is molded in one piece with a cross strap, *now also adjustable*, over the top of the head.

The headband adjustment is entirely enclosed in a Geon sleeve, smooth fitting against the head.

Jackson Leads Way with Better Helmets

NEW Nylon Friction Pivots

All pivot parts are Nylon, except the entirely enclosed spring, so no current can pass through to the wearer's head. New winged nuts provide easier hand adjustment from the outside without taking the helmet off. A stop, located inside of the helmet shell, is attached to one of the Nylon pivots to halt the helmet's down movement, and is quickly adjusted to the exact position you may require.

NEW Straight Front Helmets with Fiber Glass Shells

To those who prefer helmets of this popular shape, JACKSON now offers a line of helmets of the same quality as its curved and narrow shell styles, with the same new features. Made of fiber glass, strong, smooth, easy to clean, resistant to heat and moisture, *they last.*

For the Best in Arc Welding Helmets Jackson Offers You 3 x 3 x 2 = 18 Models to Choose from

YOUR CHOICE OF:

3	HELMET SHELLS...	CURVED SHELL	NARROW SHELL	STRAIGHT SHELL
3	LENS HOLDERS...	PLASTIC FIXED FRONT	METAL FIXED FRONT	PLASTIC LIFT FRONT
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PRODUCTS, INC.
WARREN • MICHIGAN

PRESENT at annual meeting, members of distributor association pose for group photo. (See story below.)

CITED for leadership in welding, Ray Townsend (right) accepts award from Wallace J. Erichsen. (See story below.)

News

Welding distributors meet in San Diego

The annual meeting of the Independent Welding Distributors Association was held recently in San Diego, Calif. O. H. Koll, owner of Welders Supply Service, Modesto, Calif., was elected president for the coming year. W. V. Raymond, president and general manager of California Welding Supply Co., Stockton, Calif., was elected vice-president. M. J. Andrews was re-elected secretary-treasurer.

The IWDA is an association of 25 independent welding supply distributors in the western United States, Alaska, and Hawaii. The organization was formed in 1947 so that independent distributors might exchange information regarding business methods and trade practices.

Form hardfacing sales firm in Chicago

In order to provide a complete hardfacing engineering service to industry, the Hardfacing Sales & Engineering Co. was recently organized in Chicago. Located at 242 E. 103rd St., in that city, the new firm will provide service to industries located in southern Wisconsin, northern Illinois, Chicago and the Tri-Cities area. The new firm has both office and warehouse facilities.

Hardfacing Sales & Engineering Co. will function as an exclusive distributor of products of the Stoody Co, Whittier, Calif. The new company is owned by James P. Kirk, Frank R. Daley and Ted Wiklund, all of whom have been actively engaged in distributing Stoody products for the past 10 years.

The staff of service engineers has both practical and technical experience with manual, semiautomatic and automatic hardfacing applications. All of the field engineers are capable of making recommendations and actually demonstrating hardfacing applications.

The staff includes Frank Abromitis, who will serve the Chicago area; Paul Mohoris, who will also service the Chicago area; Victor (Vic) Stucky, who will cover the Milwaukee territory; Wilbur (Bud) Abbott, who will cover the Moline, Rock Island and Davenport area. In addition, field engineers of Stoody Alloys will cooperate with the staff of Hardfacing Sales & Engineering Co.

Square D to build plant in Kentucky

Square D Co., Detroit, plans to build a $3,000,000 electrical equipment plant on a 29-acre site in Lexington, Ky. The new facility will cover 150,000 sq ft. The construction is expected to be completed in one year.

Achievement award to Ray Townsend

The Santa Clara Valley Achievement Award was recently presented to Ray Townsend, Tweco Products, Inc., for his leadership in promoting welding, and particularly the American Welding Society, at both national and local levels. The award was presented at the annual meeting of the Santa Clara Valley Section of the American Welding Society, held at the Almaden Country Club in Los Gatos, Calif.

Wallace J. Erichsen, outgoing chairman of the Santa Clara Valley Section, cited Mr. Townsend for his leadership in forming this section and for guiding and instructing officers of the section. Active in AWS activities, Mr. Townsend served as chairman of the organization committee of the first Santa Clara Valley Welding Show and Clinic. *(See* WELDING ENGINEER, *June, p. 82.)*

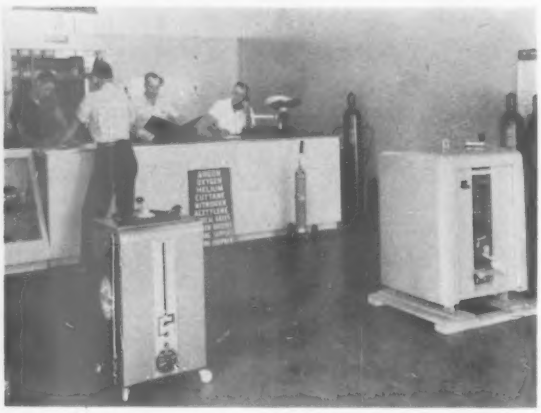
Crucible to expand titanium facilities

Crucible Steel Co. of America, and its affiliate, Rem-Cru Titanium, Inc., have begun a joint $400,000 improvement program for increasing titanium processing facilities, at the Park Works, Pittsburgh.

Improvements are expected to increase capacity of the works for the rolling of titanium sheet by 100%.

The expansion will include installation of continuous double row furnace for heating titanium slabs; erection of new building to house a bar yard and auxiliary titanium processing equipment, and remodeling of a sheet mill.

GUESTS at open house help celebrate ten years of business operation. (See story below.)



BRANCH store provides attractive decor as well as efficiency in customer service. (See story below.)

KSM holds open house

Observing its 10th year of business activity, K S M Products, Inc., Merchantville, N. J., recently held a celebratory open house.

During an afternoon and evening of celebration, KSM Products was host to suppliers, neighbors, families and friends of employees. A buffet luncheon was served, with other light refreshments.

Carborundum to boost silicon carbide output

Construction of an addition to its silicon carbide furnace plant in Vancouver, Wash., will begin soon by Carborundum Co., Niagara Falls, N. Y. To be equipped with additional electric resistance furnaces and other processing equipment, the addition is expected to increase the plant's capacity by 16%.

Linde to install oxygen supply system

A plant representing a new concept in oxygen supply systems will be installed for use in taconite mining on the Mesabi Range, at Aurora, Minn., by Linde Air Products Co., a division of Union Carbide & Carbon Corp., New York City. The new system will provide gaseous oxygen for jet-piercing machines utilized in the mining operations of Erie Mining Co.

The system will consist of two units: a huge gaseous-oxygen producing plant and a liquid-oxygen system. The oxygen plant will pump its output into pressure trailers for feed-in jet-piercing machines. The liquid system will back up the gaseous plant in order to supply oxygen for surge demands and during plant shutdowns.

The installation will be capable of supplying sufficient oxygen for Erie Mining Co.'s expected annual crude ore output of 21,500,000 tons.

Purity Cylinder in new location

Purity Cylinder Gases, Inc., Grand Rapids, Mich., has moved to a new location at 2580 28th St., S. W. (South Belt Line). The company was formerly located at 574 S. Division Ave. in that city.

40th anniversary for Southern Oxygen Co.

Established in 1916, Southern Oxygen Co., Washington, D. C., is celebrating its 40th business anniversary this year. Southern Oxygen is one of a number of firms celebrating 40 years of business activity in 1956.

With plant locations in Bladensburg, Md., Kingsport, Tenn., Greensboro, N. C., Vineland, N. J., as well as main office headquarters in Washington, D. C., Southern Oxygen has over 50 district offices and warehouses serving the southeastern states. Southern Oxygen is a supplier of oxygen, acetylene, hydrogen, carbon dioxide, and other industrial gases, welding equipment and supplies, electric welders and safety equipment.

E. R. Joseph Co. to hold clinic

E. R. Joseph Co., Norristown, Pa., will hold its annual welding clinic Sept. 11, 12 and 13 from 2 to 10 p.m. The clinic will include actual demonstrations of welding.

Delta Oxygen opens new branch store

Delta Oxygen Co., Inc., Memphis, Tenn., recently opened a branch store in Little Rock, Ark. This is the third branch store opened by the firm in the past three years. Two other branches are located at Paducah, Ky., and Greenwood, Miss.

A complete line of welding gases and supplies will be provided at the new location. Claude Flory has been named manager.

Welding supplier changes firm name

The Weber-Semmer Co., Pittsburgh, has changed its name to Weber Welding Supply Co. The change was prompted by a desire to more closely reflect company affiliation with the welding industry. Weber Welding Supply Co. is located at 5108 Liberty Ave. C. P. Weber is the owner.

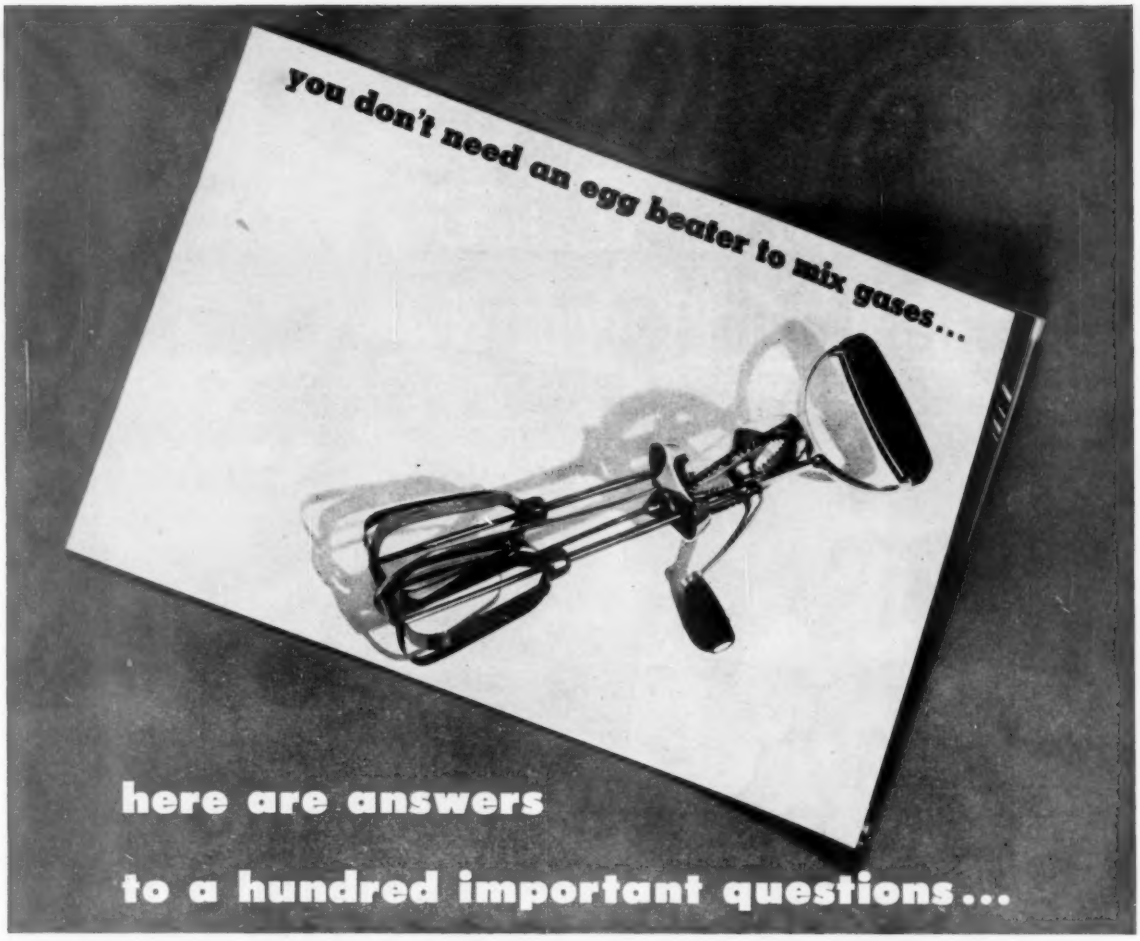
Diamond anniversary for The Webb Corp.

Celebrating its diamond anniversary this year, The Webb Corp., Webb City, Mo., has been in continuous business operation for 75 years—1881-1956.

Organized at Webb City in 1881, the firm operated as The Webb City Foundry, taking care of the needs of the mining fields which had grown quickly in this area with the discovery of lead and zinc.

With continued growth of the mines, the Webb City Foundry became active in manufacture of mining equipment. In 1907 the now Webb City Iron Works absorbed six other machine shops and foundries in the

(Continued on page 102)



Would you like answers to questions such as these?

- what is gas and how does it behave
- how do gases mix in a torch
- what are the more important flame temperatures
- which is hotter — the oxydizing or carbonizing flame
- why do some flames heat rapidly and others slowly
- can you guess the speed of a gas molecule

Would you like to see full color pictures of seven different flame types?

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The answers to these questions are but a sample of the interesting information this booklet brings to you.

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2. How CADWELD CONNECTIONS are made.
3. The principal behind the CADDY ARC WELDING CIRCUIT—"a solid copper circuit from welding machine to electrode".
4. The 6 MAIN FEATURES of the CADDY TYPE "B" fully insulated electrode holder.
5. What CADDY has over all competition.

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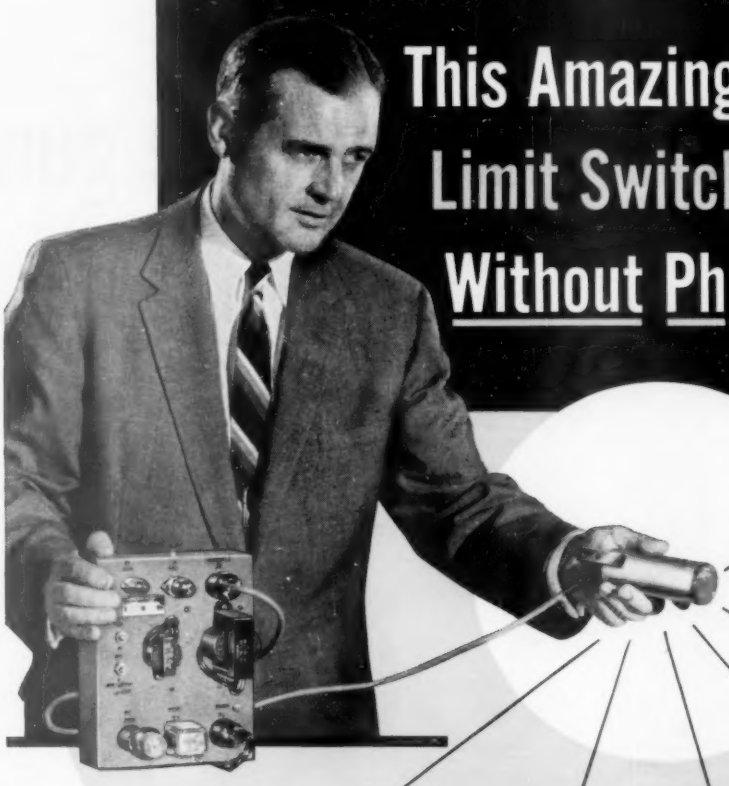

Transducer (sensing head) is actuated by presence of magnetic materials over a wide range of sizes, shapes, weights, roughness, speeds

No moving parts. No metal-to-metal contact required for operation

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NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY

For CO_2 and inert-gas metal-arc welding with direct current

...the man with the gun

The schematic above illustrates a typical inert-gas metal-arc welding installation employing SUREWELD Type SA equipment.

VERSATILE . . . IN MAXIMUM DEGREE

welds better with SUREWELD®
semi-automatic welding equipment

Your welding operator is free to focus on the direction and the perfection of the weld—when he has new SUREWELD SA Semi-Automatic Welding Equipment.

It's *automatic* . . . the nearest thing to complete automation. Electrode feeds in automatically; that means better control of weld deposit. Gas feeds in automatically; that means maximum arc stability and lowest gas consumption. Water "feeds in" automatically—for proper cooling of the torch head under varying loads. Electrode length is automatically controlled at the conclusion of the weld and *that* means the proper electrode length needed for re-striking the arc.

The basic SA outfit is for manual semi-automatic welding and consists of electronic welding control and electrode drive, welding gun, and interconnecting gas and water cable assemblies. Conversion kits enable you to convert this equipment in minutes to fully automatic welding or arc-spot work.

SA equipment is designed for use with a constant voltage type DC power source. And for best results of all, it should be teamed-up with the new SUREWELD DRCV constant voltage welder. Get all the facts about SA equipment, and new DRCV welders, too, from your nearest NCG office. Or, write for the complete illustrated bulletin NH-136.

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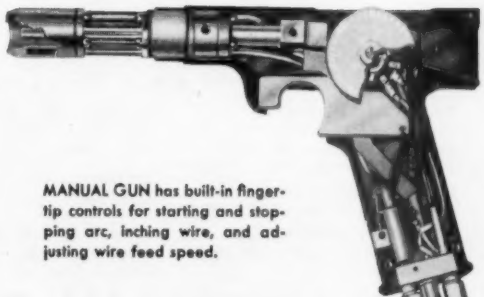
SEMI-AUTOMATIC OUTFIT for manual welding, with control unit, gun and cable assemblies. Operator's controls are on gun for convenience.

AUTOMATIC OUTFIT has remote control station, automatic gun. Types available for short and long length welding or with arc-spot feature.



MANUAL GUN has built-in finger-tip controls for starting and stopping arc, inching wire, and adjusting wire feed speed.

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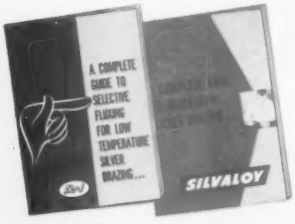
LOW TEMPERATURE SILVER BRAZING ALLOY

This is the trade mark of Brochu and Hass of Grand Rapids, Michigan—one of the more successful manufacturers in the field of forming and assembling stampings in steel, brass and aluminum for automotive, household appliance and specialty hardware manufacturers.



These two complete reference manuals for low temperature silver brazing and fluxing are available upon request. Send for either one or both.

An efficient production schedule such as Brochu and Hass developed for this stamped oil reservoir assembly (an important component of an automotive hydraulic pump system) depends upon good, consistent performance of equipment, flux and brazing alloy.

After much experimentation, Brochu and Hass selected Silvaloy preformed silver brazing alloy rings and APW Black Flux "to insure perfect, strong joints and to avoid 'leakers' and costly re-brazing." With these materials, their specially built machine is capable of completing 300 to 400 units per hour.

Silvaloy Brazing Alloys and APW Fluxes are helping to speed production, lower costs and improve brazing results in many fields. Call the Silvaloy Distributor in your area for information or technical assistance. ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

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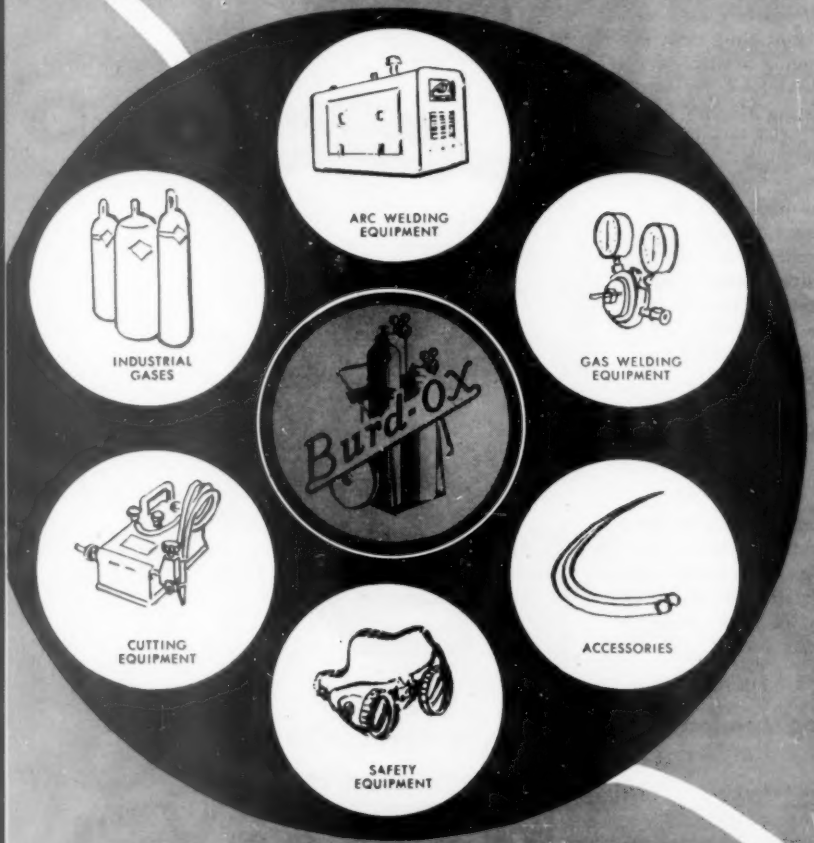
supplies ALL your needs for welding, cutting and safety equipment



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When you make BURDOX your one source for all your welding and cutting equipment and supplies you save time . . . labor . . . money! Since we handle products for all welding and cutting methods we not only recommend the best and most economical for your purpose, but supply your needs completely! You'll find by checking with BURDOX first, you'll do your welding or cutting jobs better . . . faster . . . at lower cost! Catalog on request.

THE BURDETT OXYGEN CO.

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PLANTS: Cleveland, Dayton, Findlay, Mansfield, Youngstown, Ohio and Los Angeles, California.

BRANCHES: Akron, Cincinnati, Columbus, Ohio.

Pick Your Special Electrodes

From Hundreds of Existing MALLORY Designs

Need odd-shaped electrodes for resistance welding around corners, inside channels, or other out-of-the-ordinary places?

Before you go to the time and expense of ordering custom-made special electrodes, see what Mallory existing designs can do for your job. We have flexible tooling available for hundreds of different odd-shaped electrodes. What you consider a "special" may well be an existing Mallory type that you can get on prompt delivery . . . and at economical cost.

Included in the Mallory line are cold formed single bend and double bend types. Also, cast and forged offset designs. You have a wide choice of nose shapes, tapers and lengths. Bent electrodes are made by an exclusive Mallory cold-forming technique which develops maximum strength and hardness, to assure long life. Both single and double bend types can be supplied with fluted cooling holes and water tubes bent in place*, to assure highly efficient cooling right up to the welding face. All types use specialized alloys and manufacturing methods which Mallory has developed during thirty years of pioneering and leadership in the resistance welding field.

Stock Mallory straight electrodes, holders, seam welding wheels, dies, forgings and castings are listed in the latest edition of our Resistance Welding Catalog. Write today for this valuable reference book . . . and see your local Mallory welding distributor for prompt delivery of high quality welding supplies.

*Patent No. 2,489,993.

30 Years of Resistance Welding Leadership

Expect more . . . Get more from

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SEPTEMBER
1956

Your

Weld World

at press time

Last minute news of interest to those engaged in joining and severing materials.

. . Outlook is bright for a fresh bounce in business and high employment during the rest of the year. The prospect is a top-notch summer and fall, according to the U.S. Commerce Dept. The recent steel strike did not upset the apple cart.

. . Welded steel plates will be the outer covering of a huge sphere for housing an atomic reactor which will soon be built in Illinois. Chicago Bridge and Iron Co. will build the ball for Chicago's Commonwealth Edison Co. Prime contractor for building the nuclear power plant is General Electric Co.

. . Magnesium prices were boosted following a strike settlement. Dow Chemical Co. raised the price by 1½ cents a pound on primary pig and ingot.

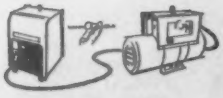
. . Many welding-equipment manufacturers enjoyed record sales and income during the first six months of this year, according to their financial reports. If the trend continues despite the 5-week steel strike, this year could better 1955's record-breaking sales.

. . Steel prices, hiked an average $8.50 per ton, may not be reflected in automobile prices if dealers have their way. Dealers are warning manufacturers that the public may not stand for another increase in car costs . . . thus 1957 could be a worse year than 1956 as far as auto sales are concerned.

. . Settlement of the short-lived aluminum strike meant a one cent per pound increase in the cost of aluminum. Alcoa made the boost just hours after its 9-day strike ended. Kaiser and Reynolds followed suit shortly thereafter. United Steelworkers won a three-year contract with package benefits of 46 cents per hour—to be spread over term of the Alcoa contract. Aluminum is now 25 cents per lb.

. . The federal tax burden on smaller corporations may be eased by the next Congress if Eisenhower's new cabinet committee on small business has its way. It has recommended reducing the rate from 30% to 20% on incomes up to $25,000.

. . Priority on defense orders for steel has been ordered by the federal government. The order, issued by the commerce department, is reportedly designed to bring steel production to maximum capacity following the recent strike, and to help avoid serious curtailment of defense materials. Steel formerly called for on Aug. 31 must be delivered no later than Sept. 30.



. . The government's program of purchasing nickel at market price from companies hiking production—reported on this page in June—has been enlarged. Premium prices will now be paid to nickel mines in the U.S., Canada and Cuba. Defense Mobilizer Arthur Flemming made the announcement, stating there would be a limit on amounts purchased, and that purchase contracts would be negotiated individually. Nickel purchased will be stockpiled.

Aluminum Welding Cable

Makes Your Job Easier!

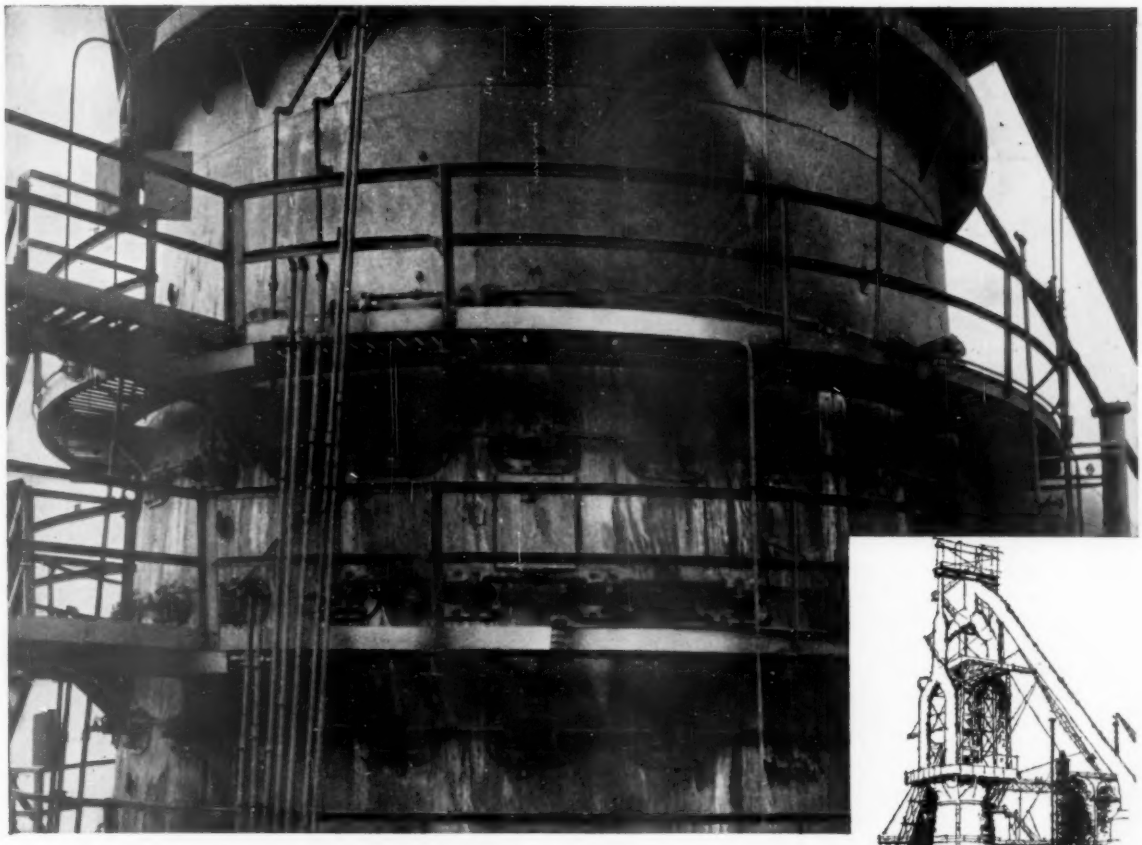
Saves Effort!

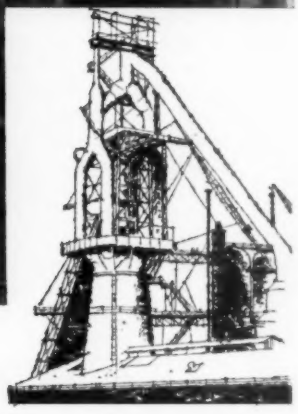
Lighter weight and superior flexibility lets you weld faster and easier on every job . . . less operator fatigue!

Type D-866 *Aluminum* Welding Cable is available in all standard sizes from General Cable.

General Cable . . . *at your service!*

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y. Offices and Distribution Centers Coast-to-Coast





Why Airco 78E electrodes were selected to weld blast furnace "R"

A large eastern steel producer planned to build the giant blast furnace designated "R". Welding – with its obvious advantages of speed and economy – was naturally selected as the best method of construction.

But – which electrode would best do the job? These were the factors involved in making a decision:

(1) Quality of weld deposit. Welds had to be leakproof to contain the 15 lb. psi pressure in the vessel. (2) High ductility and tensile strength were of prime consideration. (3) An all-position electrode was absolutely essential.

The Airco 78E electrode answered all these qualifications. Therefore, it was the logical choice. A total of 13,500 pounds of Airco 78E electrodes were used to weld the structure.

In building a blast furnace – or rebuilding an engine housing – Airco's Electrode Pocket Guide can help you take the guess work out of selecting the right electrode for the job. This 44-page booklet contains neatly condensed descriptions, applications and procedures – plus charts and graphs – for using the complete Airco line of electrodes.

It's free. Write Airco, at the address below. Request Catalog 1318-WE.

welding
AT THE FRONTIERS OF PROGRESS YOU'LL FIND . . .

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Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** – industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** – carbon dioxide, liquid-solid ("DRY-ICE") • **OHIO** – medical gases and hospital equipment • **NATIONAL CARBIDE** – pipeline acetylene and calcium carbide • **COLTON** – polyvinyl acetates, alcohols, and other synthetic resins.

PAGE offers a line of —the right packaging—the

In ever-increasing numbers, users of welding wire are looking to PAGE for their wire needs. The one biggest reason is that they have found that PAGE—in a unique degree—has the *facilities, experience* and *special skills* to draw and furnish exactly the right wire for your welding jobs. And behind that lies a story.

All Processes Closely Controlled

PAGE is *the one supplier* of welding wire who is in a perfect position to control the chemical and physical properties of its products all the way from billet to rod to finished wire. That is because we purchase our raw materials to rigid specifications; we select heats of carbon, low alloy and stainless steels for certain optimum characteristics—then, upon delivery to the mill, we analyze representative samples for compliance with PAGE specifications.

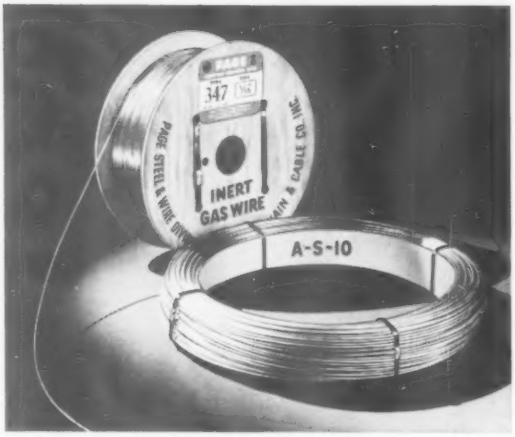
These purchasing and testing practices permit the production of wire capable of depositing weld metal which complies absolutely with welding requirements. *You don't have to compromise* when you buy, specify or use welding wire by PAGE!

Page Meets Today's Needs

One example of PAGE's facilities for furnishing a wide range of quality-controlled welding wires for modern applications is shown by our stainless steel automatic welding wire. To meet needs of recent developments in the field of inert gas welding, PAGE offers fine wires (.020″ to .09375″) for use in semi-automatic arc welding machines in which the arc is shielded with argon, helium or CO_2 inert gas. These wires, wound on non-returnable plywood reels, furnish the utmost in convenience and freedom of wire feed.

Wire for All Types of Welding

You will find many advantages in standardizing on PAGE welding wire for your needs—whether for automatic or manual use . . . arc or gas welding of all types. Not only does PAGE offer a wide range of analyses, as shown in the column at the right, but we have unsurpassed facilities for manufacturing wire to any desired size, temper or surface finish—and can furnish it promptly, in many methods of packaging, through the convenient nation-wide PAGE Distributor service.



The Right Wire— Wide Analysis Range

There are *26 different analyses* in the PAGE line. These cover the field of applications: heavy automatic submerged arc...light manual submerged . . . inert gas manual . . . automatic, tungsten or metal arc.

AUTOMATIC WELDING WIRE

CARBON STEEL...Any carbon from Armco (.025 max.) to high carbon (.90-1.10)

LOW ALLOYS...All the most popular welding grades.

STAINLESS...All standard AISI grades. Other types on request.

GAS WELDING RODS

Since 1914, the standard of quality, uniformity and satisfactory performance. PAGE offers an exceptionally wide range of rods—furnished in 36-inch lengths, in coils or on reels in the following materials: Mild Steel • Armco • Low Alloy • Carbon Steel • Stainless Steel • Manganese Bronze • Naval Bronze

BARE ELECTRODES

PAGE Bare Electrodes are supplied in any carbon from Armco to high (.90-1.10) carbon.

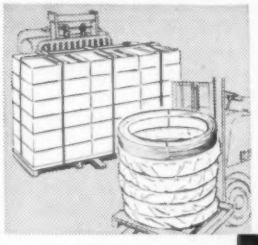
METAL SPRAY WIRE

Furnished as follows: Any carbon from Armco to 1.00 carbon • Low Alloy • Stainless Steel • Manganese Bronze • Naval Bronze

the right welding wires
right service—for modern needs

PAGE WIRES ARE PACKAGED RIGHT

PAGE Welding Wires are packaged in a wide variety of ways for the most complete protection and the utmost convenience in handling, in stocking and in use.

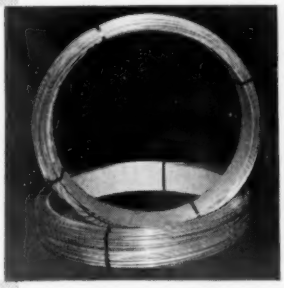


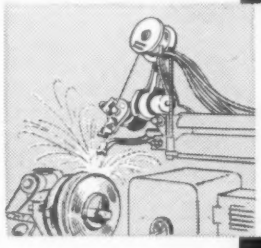
Wrapped Coils and Coils in Cartons

Single and palletized coils, each coil steel-strapped and wrapped in waterproofed paper. ...Also, coils in individual cartons, singly or palletized.

Welding Wire in Coils

PAGE A-S Automatic Welding Wire is regularly furnished in layer wound coils with cardboard liner, four Signode straps to facilitate coiling and easy unwinding.



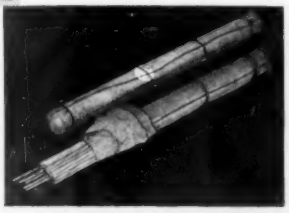


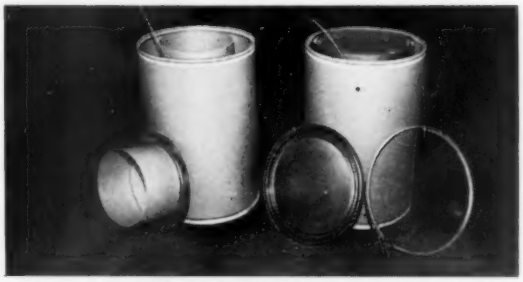
Handy Reels

PAGE Inert Gas Welding Wire is available on reels: Precision thread-wound on twenty-five-pound, non-returnable reels to fit all popular inert gas welding machines.

Gas Rod Packing

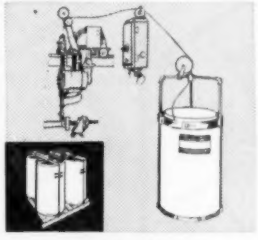
Gas welding rods are packed in 36" lengths in 50-lb. bundles—paper and burlap wrapped. Also in coils and reels (approx. 150 lbs.)—burlap wrapped. Stainless rods also come in 10-lb. fibreboard cartons.





LEFT: Pay-off-pak ready for filling, with "wire slinger" for uncoiling at extreme left. RIGHT: "Wire slinger" installed for feeding out wire; also, below, re-usable lid and retaining ring. Ring insures smooth feed-out of wire without snarls or kinks.

Sketch at right shows Pay-off-pak for continuous feeding up to 500 lbs. of wire without rethreading. Also (inset) lightweight Leverpaks. Both these containers protect against coil distortion... are easily opened, resealed, handled, stored.



PAGE Service Means Prompt Delivery From Local Stocks

You can get PAGE automatic arc welding wire, or oxy-acetylene welding rods quickly and easily from your nearby PAGE Distributor.

PAGE Distributors carry ample stocks from which your requirements can be filled without delay or inconvenience to you. This handy service not only saves you time in getting what you need, but makes it unnecessary for you to make a sizeable investment in inventory.

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Folder **DH-402A**—PAGE Submerged Arc and Inert Gas Welding Wire.

Booklet **DH-1277**—PAGE Gas Welding Rods.

Write our Monessen, Pa., office for *either or both*

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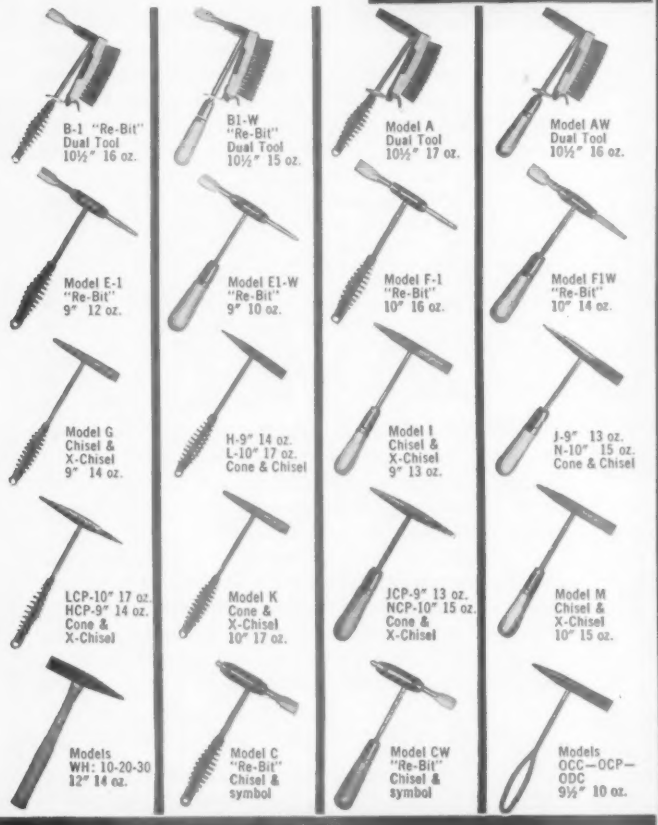
Better Value

Best quality chisel steel
Unbreakable steel shaft
Head silver brazed to shaft
Metal or wood grips
Model H Cone and Chisel one of 27 models

WHATEVER STYLE TOMAHAWK YOU BUY FOR YOUR JOB - BE SURE ITS ATLAS QUALITY


B-1 "Re-Bit" Dual Tool 10½" 16 oz.
B1-W "Re-Bit" Dual Tool 10½" 15 oz.
Model A Dual Tool 10½" 17 oz.
Model AW Dual Tool 10½" 16 oz.
Model E-1 "Re-Bit" 9" 12 oz.
Model E1-W "Re-Bit" 9" 10 oz.
Model F-1 "Re-Bit" 10" 16 oz.
Model F1W "Re-Bit" 10" 14 oz.
Model G Chisel & X-Chisel 9" 14 oz.
H-9" 14 oz. L-10" 17 oz. Cone & Chisel
Model I Chisel & X-Chisel 9" 13 oz.
J-9" 13 oz. N-10" 15 oz. Cone & Chisel
LCP-10" 17 oz. HCP-9" 14 oz. Cone & X-Chisel
Model K Cone & X-Chisel 10" 17 oz.
JCP-9" 13 oz. NCP-10" 15 oz. Cone & X-Chisel
Model M Chisel & X-Chisel 10" 15 oz.
Models WH: 10-20-30 12" 14 oz.
Model C "Re-Bit" Chisel & symbol
Model CW "Re-Bit" Chisel & symbol
Models OCC—OCP—ODC 9½" 10 oz.

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The modern Atlas plant is devoted exclusively to building the finest weld cleaning tools in America. There are models to suit the man and every type work. If you haven't tried Atlas you don't know what a difference "balance and feel" can make in production and quality of work. They can take it.

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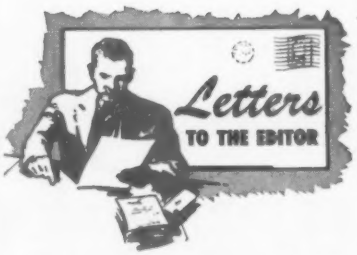


Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if requested.

Advertiser replies

Dear Sir:

With regard to the letter (p. 14, WELDING ENGINEER, Aug., 1956) from Oerlikon Machine Tool Works, Zurich, Switzerland, concerning the first appearance of an aluminum electrode with extruded coating, I should like to state the following:

Our research at Eutectic Welding Alloys Corp. was aimed at producing a low and fast-melting filler metal together with a new extruded coating permitting fast deposition with a metallic arc and with low heat input. We believe we have fully succeeded.

Research at Eutectic on aluminum arc welding dates back to 1940. We have filed several patents.

The "Eutectrode 2101" advertised in the May, 1956, issue of WELDING ENGINEER is the result of such special research. Not only does it feature a new extruded coating, but its core is made of an aluminum alloy with a high alloy content.

We have made exhaustive tests of a number of aluminum electrodes made in the United States and in Europe and we have based the claims contained in our advertisement on such tests.

R. D. Wasserman
Eutectic Welding Alloys Corp.

Flame-straightening

Dear Sir:

We receive WELDING ENGINEER here at Raritan Arsenal in Metuchen, N. J. The articles are extremely informative. I especially liked "Flame-straightening: a friend in need" by Joseph Holt in the Oct. and Dec., 1955, issues.

Stanley Zulkowski
Newark, N. J.

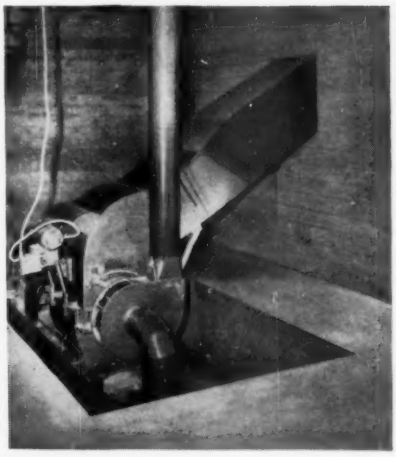
—The articles by Mr. Holt and also these on welded houses have evoked an enthusiastic reader response.

HOW USS "T-1" STEEL IMPROVES THESE PRODUCTS...

Lower-Cost Dirt. This mammoth coal stripping machine scoops out 2000 cu. yds. of overburden an hour, cuts the cost of stripping coal that lies under 50 to 80 ft. of overburden. Its 22-ft. wheel carries eight buckets, each 4 ft. wide, with lips of 2½-inch USS "T-1" Steel. USS "T-1" Steel has the strength and toughness to scrape through shale, rock, mud, and ram into ton-and-a-half boulders day in and day out. In addition, it is weldable in the field, costs less than other steels that could be used—and outlasts them. This wheel excavator was designed by United Electric Coal Companies, Chicago, for their own use.

Moloney Saves A Ton. The size of everything had to be reduced on this new, smaller-than-ever portable transformer designed by Moloney Electric Company, St. Louis, Missouri. Over a ton of weight was saved in the tank alone by building it of ¼-inch USS "T-1" Steel instead of ⅜-inch carbon steel. The very high strength of this heat-treated alloy steel made possible this 25% saving in weight. The excellent weldability of USS "T-1" Steel was important, too, because this portable transformer is permanently welded to the bed of a semi-trailer. This particular unit was designed for Oklahoma Gas & Electric Corporation. Shell was fabricated by Nooter Corporation, St. Louis.

Heavier Loads, More Production. Mack Welding Company, Duluth, Minnesota, has used USS "T-1" Steel to increase the durability and at the same time reduce the weight of its Orange Peel Type, Four Tine Pulpwood Grapples. With these new, lightweight grapples, crane operators can handle increased payloads with present cranes. As a result, production can be increased as much as 40 percent.



Shucks, hay fodder, corn cobs, and grains are extremely abrasive when sucked out of a hammermill at high speed. And the blades of the fan that does the sucking must be able to withstand the abrasion and must be weldable. Myers-Sherman Company, Streator, Illinois, manufacturers of industrial hammermills, now make these fan blades from USS "T-1" Steel and save $7 on fabrication of each fan. USS "T-1" Steel provides all the needed durability, as well as good weldability.

HOW IT CAN HELP YOU

USS "T-1" Steel, with its high minimum yield strength of 90,000 psi and its minimum tensile strength of 105,000 psi, can help you design or build lighter-weight equipment that will last longer. Its unusual toughness can help you design or build equipment capable of taking severe impact and abuse at sub-zero temperatures. Its excellent weldability can help you cut the cost of fabricating high strength parts, and to reduce repairs and maintenance expense.

Somewhere in your operation, versatile USS "T-1" Steel can help you. Write, wire, or phone United States Steel, Room 5414, Pittsburgh 30, Pa.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.

UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS "T1" CONSTRUCTIONAL ALLOY STEEL

See The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

USS

UNITED STATES STEEL

Only P&H AC/DC Welders give you

7 Welders in 1

. . . you get AC or DC at the flip of a switch—
plus quick, exact heat from Dial-lectric Control

One P&H AC/DC Welder now does the work of seven separate welding machines. This versatile 1 for 7 P&H machine reduces your capital investment—saves time and money — gives you better welds. The P&H AC/DC Welder also has Dial-lectric control for instant heat adjustment through the entire range.

Because of its flexibility, the P&H AC/DC Welder opens many new welding opportunities for large and small plants. It's so easy to use that even new men make good welds on "difficult" metals. There's a right size P&H AC/DC Welder for most needs. Capacities range from 7 amps to 675 amps. Write today for more information.

HARNISCHFEGER
MILWAUKEE 46, WISCONSIN

I'M SMOOTH ARC SCOTTY... and I'm tellin' you seven ways you can use the P&H AC/DC Welder. Take any one of the seven, and it beats anything you've ever used. Send in the coupon for complete information... free!

1 Heliarc* DC Straight or Reverse
2 Heliarc* AC
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5 Metallic Arc DC Straight or Reverse
6 Metallic Arc AC
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the P&H *Line*

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BETWEEN PASSES

notable statistic

When June ended, the American Iron and Steel Institute toted up production since the end of World War II, found that steel-making furnaces in the United States belched forth more than one billion (1,000,000,000) tons. This in less than 11 years. Last time, it took 18 years to make a similar amount. Another record: the 12-month output from July, 1955, to June, 1956—more than 122 million tons.

large enough

Speaking of steel, its average increase of $8.50 a ton following the strike fell short of the predicted $10-$15 boost. On the other hand, it is still the largest hike since the end of World War II. Nobody seems agreed on how much the addition will be reflected in prices of consumers' hard goods . . . except that it doubtlessly will.

looking for a job?

Never have the offices of *Welding Engineer* been so busy trying to match men and jobs as they were in July. There were, and are, available jobs for a production superintendent for gas-welding equipment; a metallurgist with welding-electrode and coating experience; a sales manager for positioning equipment; another sales manager for arc accessories, and several welding engineering positions calling for production and design experience. If you're interested in any of these jobs, write the editor of this page.

read this one

Beyond this page, in the regular feature-article section, you will find the second part of "Fixtures for Brazing," by A. M. Setapen of Handy and Harman. Be sure to read this comprehensive story on designing work-holding fixtures for brazing. If you haven't read Part I in the August issue, it will be well worth going back to it. Another interesting one, although not from a technical viewpoint, is "The quiet weldors of New Melleray abbey," which tells about silent Trappist monks who know the value of welding.

what's in a name dept.

Our inquiry section tells us we have received a card from "Weld" Morgan of Worcester, Mass, We don't know whether this reader's first name is an abbreviation of Weldon . . . or of welding, weldor, etc. But here is a man who definitely is in the right field. Mr Morgan, incidentally, is vice president of operations for Morgan Construction Co. of Worcester. Our circulation manager, Jim Brewster, says only the company's name is on the sub list, so we have no way of knowing about the first name. How about it, Weld?

our sad plight

Problems? We all have them. Pity the poor editor . . . especially if his is a monthly publication. Timing is essential to good journalism, but what do you do when deadlines must be met, and several days later the steel strike is settled? Another case in point: in last month's issue of *Welding Engineer*, you probably read about the IAA and AWS convention conflicts on page 6 and in these columns. The latter was more up-to-date because this page went to press later than did page 6. Hence the discrepancy . . . anyway, we're glad to see that the International Acetylene Association will conduct its meeting earlier. Now we shall be able to cover both . . . a fortunate circumstance since we have relatives in Minneapolis and in Philadelphia . . . nice ones, the kind you *like* to visit.

testing a test

The welding lab at the U. S. Naval Engineering Experiment Station, Annapolis, Md., has devised quick test for checking effectiveness of dye penetrants used in detecting surface flaws. To simulate a tiny surface crack, two pieces of tubing are butted tightly together in a fixture. If the crack is revealed by the dye penetrant spread in the area, the product is considered suitable for use by the Bureau of Ships.

real cool!

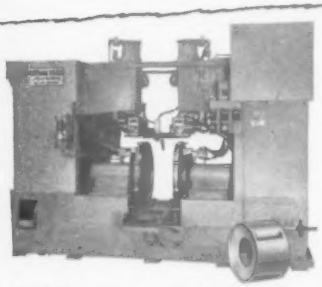
A Navy release forwarded to us by a former editor, Jerry Shaffer, now on duty in Washington, D. C., has turned the spotlight on a group of chilled but undaunted weldor-steelworkers currently plying their trade in the subzero clime of McMurdo Sound, Antarctica. These hardy members of Operation Deepfreeze claim they can weld "everything from broken hearts to the crack of dawn," and the Navy report backs them up. Operating from an open sled (on 24-hour call), weldors Chris Kennedy, Norm Nason, Dewey Kemp and C. H. Roberts have fabricated storage tanks for 100,000 gal of diesel fuel and 250,000 gal of aviation gasoline. They have made structural repairs on 35-ton tractors and one-ton sleds; they have welded broken tail skis on aircraft, cracked aluminum air scoops on helicopter engines and broken anchor chains. The boys have justly named their set-up the "Broken Drum Welding Shop"— it can't be beat.

do tell!

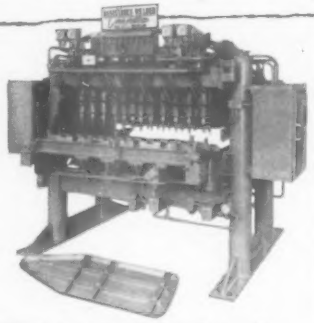
September is "Better Breakfast Month," and one of its weeks has been tentatively scheduled as "National Sweater Week." 'Nuff said.

Cost CONSCIOUS!

Do these examples of high production resistance welding and multi-purpose machines suggest a solution to a bottleneck in your production? . . . a cost reduction on your welded assemblies?

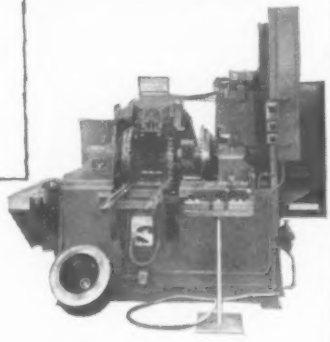


Machine seam welds front and back panels to Washer—Dryer Tub . . . automatically loaded and ejected . . . 100 per hour.



Shuttle type three (3) station multi-spot welder makes total of (60) spot welds on ironing board . . . 240 assemblies per hour.

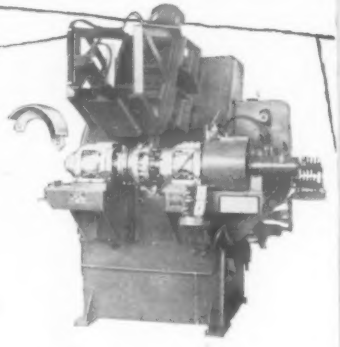
Multi-purpose unit rolls wrapper around front and back panels and makes (84) spot welds to form Washer Spinner Tub . . . (75) complete operations per hour.



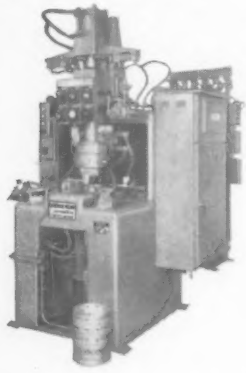
Rely ON RESISTANCE

for high production welding and allied equipments designed for a minimum of manual handling.

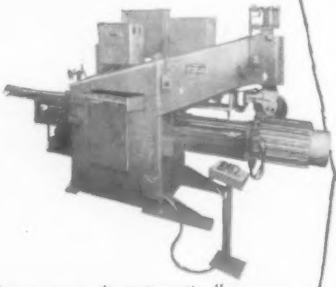
- ★ higher production
- ★ lower unit costs
- ★ uniform quality
- ★ save floor space and handling costs



Multi-purpose unit feeds and forms Brake Shoe Table to Web and simultaneously welds Table to Web . . . has interchangeable fixtures for single and double Web Shoes of various radii—600 per hour.



Unit gages, stretches and tack welds stainless steel Rings to form Jet Engine Components . . . close tolerances maintained.



Multi-purpose unit automatically feeds and roll spot welds cooling Fins to Power Distribution Transformer Tanks . . . tank is automatically indexed to position for each Fin . . . tank sizes vary.

- Complete line of standard spot, projection, seam and flash-butt welders.
- Special welding and multi-purpose machines.
- Complete automated production lines.

RESISTANCE WELDER Corporation
BAY CITY, MICHIGAN

saves time... saves money

The OXWELD CM-45 Portable Machine Carriage and new PUROX C-205 Blowpipe handle straight-line cutting, bevel-cutting, circle-cutting—any mechanized cutting job in the light-to-medium range—with greater speed, accuracy, and economy.

Portable—The CM-45 works anywhere — in shop or field. It weighs only 32 lbs. complete with blowpipe, and can be moved easily from job to job.

Accurate—New PUROX C-205 Blowpipe produces clean, sharp-edge cuts in steel up to 8 in. thick.

Easy to Operate—All controls are conveniently located. Starting, stopping, and reversing are handled instantly with single control switch.

Economical—Smooth, uniform control of the CM-45 gives maximum amount of cutting per cu. ft. of gas consumed. Combined with greater speed and accuracy, this means substantial savings in time, money, and materials.

See for yourself the many efficiency-increasing benefits of mechanized cutting with the OXWELD CM-45 Machine Carriage and PUROX C-205 Blowpipe. Ask for a demonstration today.

Get it from your LINDE jobber...

Or write for further information. LINDE AIR PRODUCTS COMPANY, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. *In Canada:* Linde Air Products Company, Division of Union Carbide Canada Limited, Toronto.

When a sheet metal electrode...

Has exceptionally smooth arc action... easy slag removal...

Yet operates on lower currents without sticking... with less burn through...

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use anything but FLEETWELD 37 for thin gauge work

An E-6013 electrode made specially for sheet metal

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to give you:

- Lowest burn through
- Less sticking at low currents
- Smoother corner and edge welds
- Faster operation on DC negative
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Specifications and Procedures are given in Weldirectory SB-1351. Write

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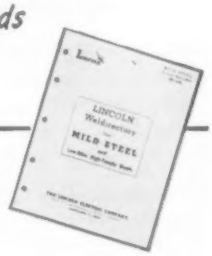

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Name_____

Position_____

SEPTEMBER, 1956

Welding Engineer

ESTABLISHED 1916

The customer isn't always right

DURING the past 15 years, we have found there is little truth in the slogan "the customer is always right." The dawn didn't come up like thunder—we learned our lesson slowly. We continued, however, to nourish faint hopes for greater appreciation as a canny consumer until Brownell's Justice Department came along to crush them.

Who would have thought the government could crack down on General Motors Corp. just because it makes such good buses that over 70% of the nation's bus buyers want a GM product? This is no misstatement of the case which has resulted in a bewildering "anti-monopoly" suit.

Why should the federal government strive to break up big business? Only because it is big and efficient? Bigness itself is not a sin when coupled with *efficiency*. And GM's efficiency has enabled it to effect economies in all phases of production and selling. Is that any reason why this company should suffer the sting of government harassment?

The old saw that advises us to build a better mousetrap might well be revised to more accurately state: "build a better product and watch Uncle Sam step in."

What's happening to GM could happen to you!

That is precisely why we cannot fathom public apathy concerning the case. It's that same brand of complacency with which we met the government's give-away and spending-spree programs—the complacency that may one day net us the loss of freedoms we have cherished a very long time.

WE FULLY realize that it's difficult to feel resentment, or the urge to take action, when remote incidents apparently are not hurting us personally—in our homes or in our pocketbooks. But the GM case is not just one of "a big outfit that can well afford to defend itself." It's not a case that's "no skin off our nose."

In our estimation, this government suit penalizes efficiency and makes the buyer's market a joke. It is highly damaging to incentive, both individual and corporate. Lurking behind large-scale product improvement programs, it seems, there is always this threat of Big Government lawsuits.

Transit companies aren't being forced to buy GM buses, just as no one is forcing the metalworking industry to buy machines and electrodes from the more efficient manufacturers of welding equipment and supplies.

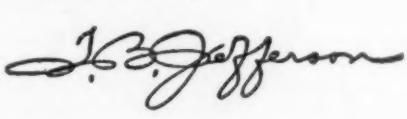
IT'S UNLIKELY that a manufacturer of welding equipment would make a product outstanding enough to capture 72% of the market. But if it did . . . what then? *This firm would be out of business simply because the customer was right in choosing a better, more economical product!*

What happens to freedom of choice if larger and more efficient firms are forced to curtail activities by what seems to be extra-legal action? The customer's choice, naturally, is also curtailed due to resultant product shortages.

Our paternalistic federal government is reportedly out to protect us against the evils of big business. But who is to protect us from Big Government?

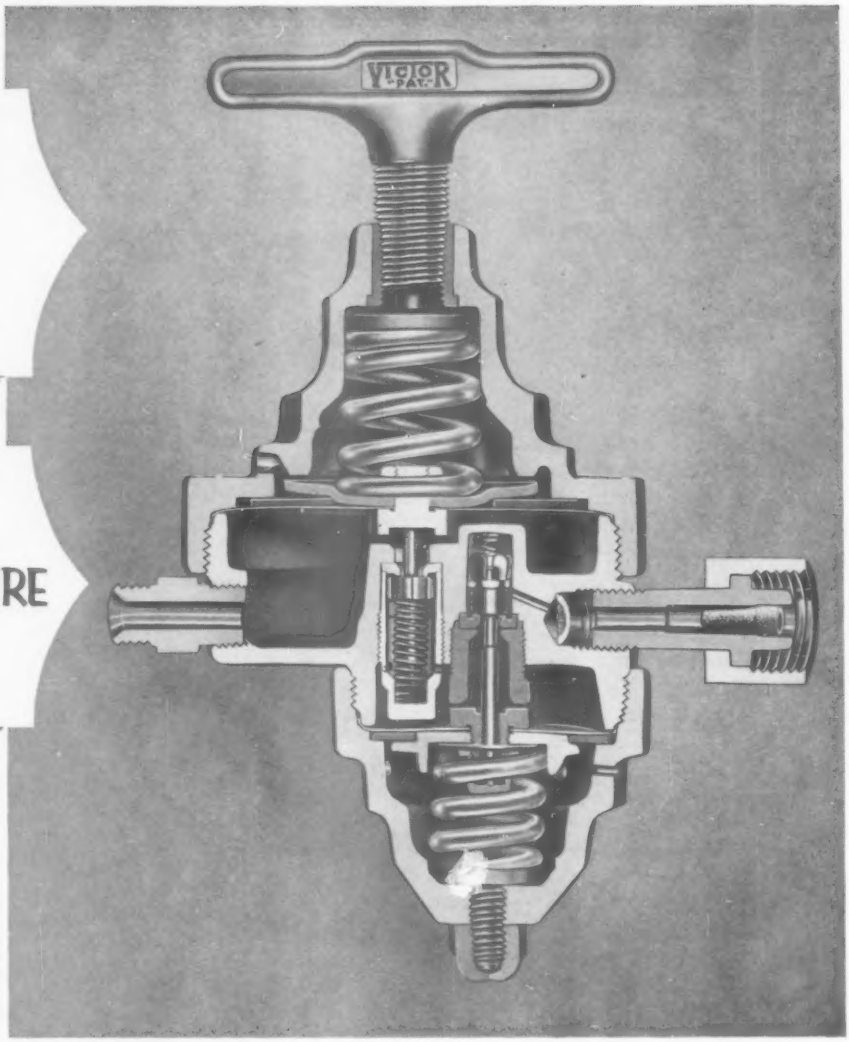
We are not advocating a return to the "public be damned" philosophy of old-time monopolists. But, on the other hand, we are definitely not in favor of a socialistic "big brother" who oversees our every move.

Certain protective and beneficial social measures passed for the good of a large portion of our citizens cannot be denied. But we must never forget that individual incentive *made* this country and that, in needing to a crucial degree the continuance of broad and ambitious developments, we are woefully vulnerable to a governmental system that daily grows more ponderous, more conservative and less willing to face a future hinged on the give-and-take of free men in a freely competitive society.



The man on the job prefers **VICTOR** Safety Regulators

THIS INSIDE PICTURE TELLS WHY



Cut-away of Model VTS400 series 2-stage Safety Regulator. Victor makes regulators for almost every gas and use, for pressures to 10,000 p.s.i., and volumes to 28,000 c.f.h.

You Get Greater Safety. All Victor regulators have the "stem type" seat mechanism that closes with the impact of inlet pressure, and is protected from seat ignition because the incoming gas loses its heat of compression by expanding into the inlet pressure chamber before passing over the seat and through the nozzle. Dense die forged bodies and spring housing caps provide maximum strength and durability. High inlet pressure type regulators have a reliable, self-reseating relief valve that insures complete protection. Diaphragms are protected from excessive and damaging movements by "stops" and rubber cushions. A porous sintered bronze inlet filter keeps out injurious dirt and foreign material.

Single and Two-stage Types. Victor offers single-stage regulators to meet most capacity or delivery pressure requirements; and two-stage regulators for operations which require a constant delivery pressure over a range of varying inlet pressures.

Many nationally known companies, small and large, and in all types of industry have standardized on Victor Safety Regulators because of their trouble-free operational characteristics and reliable service.

Call your Victor dealer NOW.

VICTOR for welding

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

32

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Here's a job shop that finds business on certain days can be . . .

"Just like a grocery store"

POSING with impressive array of service vehicles, Grover Welding Service crew includes (left to right) partners Vern Grover, Jr., Frank Jaekel and Vern Grover, Sr., and weldors Bud Tenerelli and Andy Hartman.

By Jack Fairlie

A POLICE squad car pulling up to the door of a business establishment might possibly signify trouble anywhere but in Skokie, Ill. For Grover Welding Service, a job shop in this Chicago suburb, it means a new customer.

Located in an out-of-the-way spot on Terminal Ave., Grover Welding must sometimes depend on the friendly cooperation of the local police department for help in guiding lost patrons to the shop's door.

No signs on principal roads point the way to this shop; advertisements in local papers fail to tell the interested reader how to follow the "here again, gone again" meanderings of Terminal Ave.

But Vern Grover and his partners, Frank Jaekel and son Vern ("Buzz") Grover, Jr., show no concern over their geographical anonymity. They know from rich experience that the well-rounded welding craftsmanship and facilities they have to offer will continue to be sought out by a growing list of new customers.

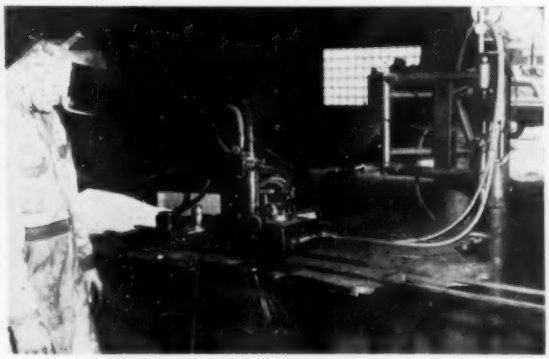
Including Tig

The most basic Grover facility is a large building, erected just over two years ago, which offers about 4,000 sq ft of shop and office space. Adjoining this brick structure is a vacant lot with over 6,000 sq ft of space for vehicle storage and welding maintenance on very large units.

Inside the Grover plant are four welding machines, two automatic flame-cutting machines (one of which will trace many intricate patterns), several manual flame-cutting stations, three power saws, and all the other miscellaneous equipment found in any job shop intent on seriously competing in a diversified market.

Power sources in the shop include a 300-amp motor generator set; a 285-amp m-g welder; a 200-amp rectifier welder which supplies current for a Tig (tungsten inert-gas) torch, and a 300-amp d-c rectifier set.

WELDOR Bud Tenerelli picks up oxyacetylene torch to flame-cut part for truck-mounted crane undergoing repairs. Up to 36 tanks of oxygen and acetylene are consumed in shop and portable operations every month.



SMALL flame-cutting machine trims ⅜-in. cold-rolled steel plate for all-welded die box as Vern Grover, Jr., stands by. At right is another automatic flame-cutter which uses templates to trace cut.

JOB completed two years ago was fabrication of one of the largest tree-remover cranes ever mounted on a truck chassis. Grover used E6010 and E6012 electrodes in ⅛ to ¼-in. sizes to join mild steel plate and wrinkle-bent tubing. Four winches provide power.

It is the Tig welding unit, of course, which gives the shop an edge over local competition. Used almost exclusively in welding aluminum and aluminum die castings, it is paying Grover Welding good dividends while bringing in customers who might otherwise have to be turned away.

Portable Service

But it isn't only Tig that recommends Grover to prospective customers in northern Illinois. This five-man shop (weldors Bud Tenerelli and Andy Hartman work with the co-owners) operates a fleet of five vehicles: a station wagon, a ½-ton panel truck, two trucks equipped with portable welding units and a flat-bed truck fitted out with a sturdy boom and power winch.

The portable welding units see continual action, largely in emergency repairs on boilers—a Grover specialty. Mounted on the trucks are identical 285-amp engine-drive welders, together with oxyacetylene flame-cutting equipment and other useful paraphernalia.

Present operations of Grover Welding consume 32 to 36 tanks of oxygen and acetylene per month, approximately 1,000 lb of electrodes, and about 220 cu ft of argon. The latter gas is used on a 100% basis in Tig welding for reasons of economy. Twelve tanks are tapped at one time in the shop and on the trucks, while 20 remain in stock.

Diverse Skills

Jobs which the Grover Welding Service crew will bid on—or have brought to them—are too numerous to itemize. There is no actual job specialization, and practically every weldor is capable of performing Tig or manual arc welding, oxyacetylene welding or flame-cutting, buildup or hardfacing, brazing or soldering.

Vern Grover, acknowledged as the boss in the shop, has a lifetime of welding experience in job shops. He has achieved with his partners the type of operation that many an ambitious weldor dreams about.

Working in Skokie since 1928, he began independent operations in 1940. The rented garage that housed Grover Welding Service from that date until May, 1954, when it entered new quarters, offered little space but unlimited opportunities for the solid growth so evident in its latest location.

Success, measured frequently at Grover in valuable contracts for special parts, is nevertheless most evident when a steady stream of customers brings parts and machines into the shop for fabrication or repair.

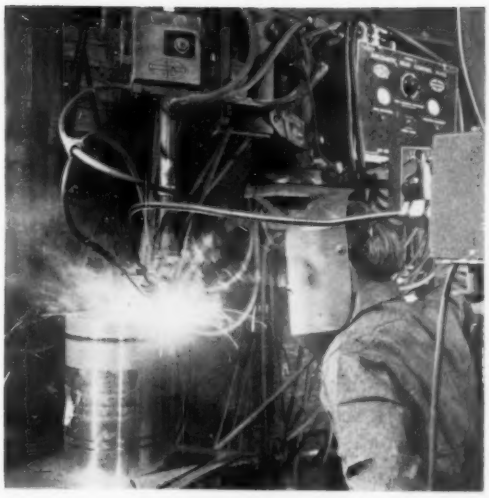
At times like this, Vern Grover may be heard to remark, with no little satisfaction, that "on some days, this shop is just like a grocery store."

TIG unit is used by partner Frank Jaekel on cracked aluminum motor block. Filler metal is ⅛-in. aluminum welding rod. When torch is hung on hook in foreground, gas supply is automatically shut off.

NEW high-carbon trunnion ears are welded to crane boom by Andy Hartman, using ⅝-in. E6010 electrodes at 120 amp, 22 volts. Steel plate is ¾-in. thick. Shop housed crane comfortably during repairs

WHILE customer waits, Frank Jaekel welds crack in cast iron water pump for tractor. Electrode is ⅛-in. cast iron type. Many such jobs are brought in daily and must be fitted into regularly scheduled work.

WHEN piston is preheated to 300 F, welding begins. A 75-25 mixture of helium and argon provides gas shield.



Mig process speeds welding of pistons

OPERATOR is shown placing piston ring carrier — heated to 400 F—over main body of piston. Use of ring carrier means ring grooves are not cut into piston itself, but are in removable carrier.

By S. L. Sullivan and John Gowen
Air Reduction Sales Co.
New York, N. Y.

THROUGH coordination of design, material specifications, and a unique application of the Mig (metal inert-gas) welding process, Alco Products, Inc., Schenectady, N. Y., has quadrupled welding speed on aluminum pistons for diesel locomotives.

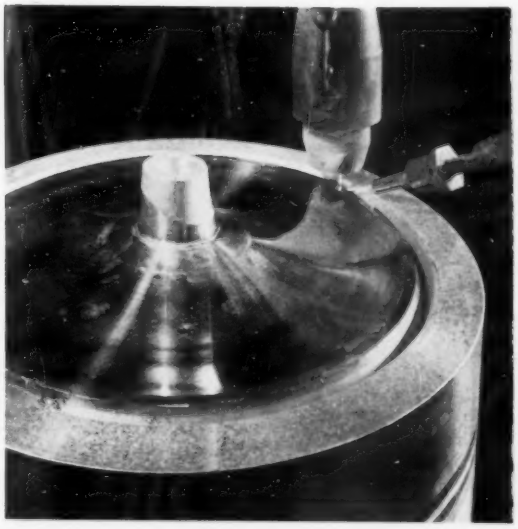
Such pistons must be designed to provide maximum durability because of the rigorous firing-chamber conditions of their use.

The aluminum piston, measuring 9 in. in diameter and 12¼ in. high, is designed to receive, by shrink fitting, a piston ring carrier over the upper third of its length. The carrier is heated to 400 F before it is placed over the main body of the piston.

Grooves in Carrier

Use of a ring carrier means that ring grooves are not cut into the piston itself, but are in the ring carrier. This section can be removed for repairs and put back on the main body of the piston for further service.

The piston itself is a forging. The ring carrier is cast aluminum with a nickel-iron ring cast into it to reduce wear. The carrier originally was welded to the main body of the piston with a machine set-up using the Tig (tungsten inert-gas) process after it was forged. It took 4½ minutes to weld the 22-in. circumferential seam.



CIRCUMFERENTIAL joint was redesigned into ⅜-in. bevel groove when Mig welding set-up was installed. Pictured is groove before welding.

With the use of cast aluminum ring carriers, it became necessary to reduce heat input substantially to avoid cracking. The circumferential joint was redesigned into a 3/8-in. bevel groove and a fully automatic Mig welding set-up was installed.

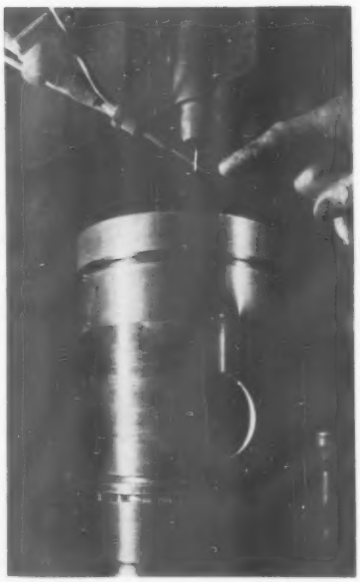
Filler Wires

The Mig machine made use of two filler wires, one hot and one cold. The cold filler wire, with no welding current, came in at an angle; the wire carrying current came from the nozzle of the welding head.

Welding took place after the piston had been heated to 300 F. A 75-25 mixture of helium and argon provided the gas shield.

The inherently high deposition rate of the Mig process, plus the auxiliary wire feeder, enabled Alco to build up the 22-in. circumferential seam in one revolution of the piston at a speed of 22 ipm. Thus, welding time was reduced from more than four minutes to about one minute.

Even more important than fast production was the fact that welding speed reduced heat input per inch of weld to a minimum and eliminated cracking. Through use of the Mig process, time was saved and desired durability was achieved.



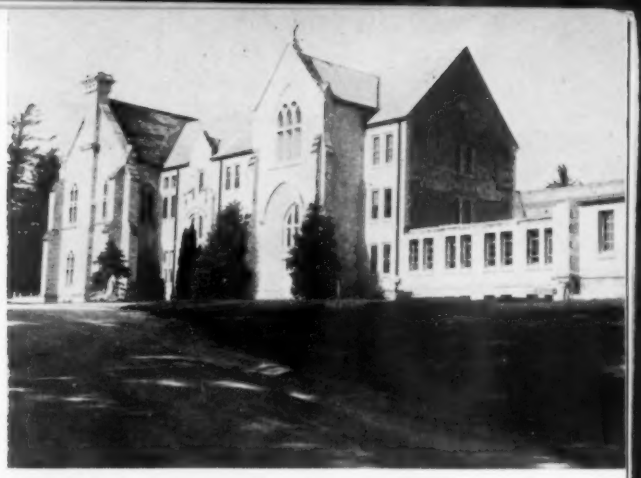
CLOSE-UP of two filler wires, one cold and one hot. Cold wire, with no welding current, comes in at angle. Hot wire, carrying current, comes from nozzle of welding head.

WHEN welding procedure has been completed on pistons, circumferential welds are ready for machining. Pictured are pistons just before machining. Photograph distorts some units in foreground.

TOP and bottom view of pistons with wrist-pin caps removed. These pistons have been completely finished and are now ready for installation.

PISTONS which have been welded and machined are being installed in Alco diesel locomotive engine frame with the aid of a hoist.

We had originally expected to entitle this article "Maintenance in a monastery," but that was before we had actually visited the premises of this Trappist abbey and found that the monks fabricated as much by welding as they repaired.



GENERAL view of the Abbey of Our Lady of New Melleray. New wing at right is under construction. Stone-cutting and all phases of the work are performed by monks themselves.

The quiet weldors of New Melleray abbey

By F. T. Tancula

IMPROVISATION is the watchword in many a welding shop, but nowhere is it more applicable than at the Abbey of Our Lady of New Melleray, a Trappist monastery about 10 miles southwest of Dubuque, Iowa.

None of the men who weld here is an expert, but through constant reading and occasional advice from friends in the industry, the welding department, if we can call it that, usually manages to solve problems that confront it.

Approximately 117 men are members of this Roman Catholic community, which is practically a self-sufficient group. The abbey's total land area is devoted largely to farming operations. To care for that much land, machinery of all types is necessary. Also, because of the nature of the monastic life these Cistercian monks lead, their work includes many different kinds of construction.

(The abbey, named after other Cistercian abbeys in Ireland and France, was founded outside Dubuque more than 100 years ago by monks from the Irish house.)

Seven Weldors

Despite their retreat from personal material possessions, and the fact that they speak only when absolutely necessary (using a simple sign language for communication) the monks, most of whom are young men well under 40, are not unaware of modern tools and methods.

Welding as a means of fabricating metals and as a maintenance tool has not been neglected. Of the 117 men in the abbey, seven are able to weld by both the arc and oxyacetylene processes. However, not more than one can properly be called a full-time weldor.

None of the seven had ever earned his living by welding before entering the order, although two had welded before.

Because they are almost self-sufficient, the monks must perform all types of manual labor . . . which might mean one day a weldor, the next a farmer. Despite this need for "doubling in brass," the men who weld have learned their metal-joining lessons well.

Among the many types of metals that have had to be fabricated (or repaired) at New Melleray are mild steel (piping and tanks), cast iron (cement mixers and wheels for hay balers), bronze (valves for the steam system), aluminum (windows), and stainless steel (laundry equipment).

All ot these have been joined by manual arc or

BROTHER is shown astride boom of large power crane, repair welding a girder joint. In background is wing under construction. Visible in rear atop roof of another section is the tower used by the abbey for its role in spotting aircraft as a member of the U.S. Ground Observer Corps.

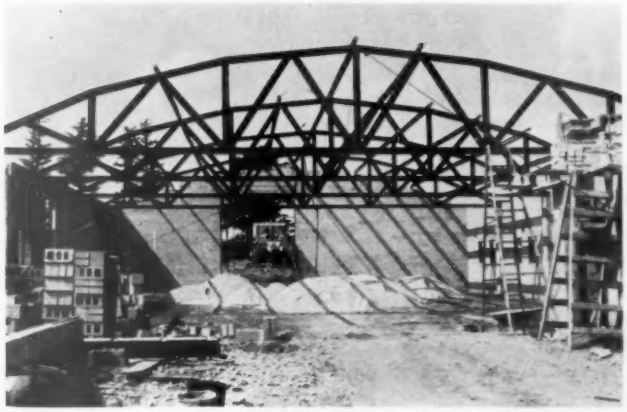
BROTHER weldor prepares to strike an arc to join purlin to top member of truss in construction of maintenance and farm machinery garage pictured on opposite page. Trusses are 6-in. I-beams with 60-ft span.

FARM equipment has to be maintained for the abbey's extensive farming operations. Here one of the brothers is repairing a tubular steel tongue on a tractor wagon.

WELDING a 6-in. pipeline. Line will serve as a water main from the pump house to supply farm buildings and new maintenance garage, as well as serving as additional fire protection. On this pipeline job, Trappist brother is using an 1/8-in. E6010 electrode for the first two passes and a 5/32-in. for final pass. Power source is a 200-amp portable d-c welder. Horse is of welded steel, made by the abbey welding crew.

FIRE-fighting equipment consists of these two trucks. One at left has had body floor flame-cut away and a 700-gal welded tank joined to frame . . . also by welding. This fire truck is of 1914 vintage, was once owned by city of Rockford, Ill.

ALUMINUM window frames for new building wing are welded by oxyacetylene process. Here brother is preheating the joint area before adding flux-dipped filler wire. Rotating fixture is also another example of the "do-it-yourself" atmosphere around the abbey.



MAINTENANCE and farm machinery garage now under construction has four 60-ft span trusses fabricated from 6-in. I-beams. Spans were laid out on huge master template on ground, welded, then raised to position by means of crane.

FLAME-cutting a flange prior to some corrective welding. This shell will be part of water conditioner for feed water system for the abbey's boilers. In gas welding and cutting, the abbey uses oxygen and acetylene.

oxyacetylene welding. As might be expected, no Tig, Mig or submerged-arc welding is done at the abbey, though Tig once was considered as a means of fabricating the aluminum windows.

Expansion Program

These window frames are being installed in the new wing now under construction as part of the abbey's large expansion program. Since 1944, the number of men seeking admittance has increased until the abbey now has what might be called a branch in Springfield, Mo. The Iowa house has been outgrown for some years.

Practically all construction work is being carried on by residents of the abbey. Only in a few instances has it been necessary to call in outside help.

About a year and a half ago, one of the brothers visited the plant of a welding equipment manufacturer for the specific purpose of obtaining information on welding aluminum for window frames. Steel had been used before, but now all abbey windows being replaced or newly installed are of welded aluminum construction.

Fabrication takes place in the weld shop in the abbey's sub-basement. Advice given by manufacturers led the brother weldors to use the oxyacetylene method for joining the aluminum angles. The Tig process was rejected because it was uneconomical for such small production.

The abbey's arc welding equipment includes five d-c motor-generator sets, one a-c welder and one portable d-c machine. The m-g sets are 400-amp capacity; the a-c is 440-amp; and the portable is a 200-amp welder.

Some Equipment Donated

Four of these machines are generally in use. The others might be, and usually are, laid up in the repair shop. Most of the welding equipment is either war surplus or is used machinery that has been donated by friends of the Trappists. This is true also of other types of electrical and mechanical equipment.

Most of the electrodes consumed in welding operations about the abbey are of the E6010 and E6013 varieties. During last fall and winter, about 500 lb of electrodes were consumed at New Melleray. This figure, small by comparison with commerical shops, was much larger than usual because of a boiler-breeching project welded early in the fall.

Starting in August, 1955, the brothers tore out the old boiler system and with some outside help installed two new low-pressure boilers and one high-pressure boiler.

Working almost day and night, and with the limited facilities mentioned, the monks were able to complete installation of the new boilers by Oct. 29. Piping, as well as breeching from the boilers to the vertical stack, was manually arc welded by the brothers.

Many of the welding practices at New Melleray are unique . . . some of them might even be frowned upon in better-equipped shops. But they achieve good results . . . witness the jobs illustrated on these pages.

Whether he becomes a weldor, farmer, or stone-cutter, the novice entering the abbey is assured of one thing—he will never be without a job.

CELLULAR aluminum sandwich structure (left) is soldered without addition of flux. Leaning against brick is aluminum sheet which shows—to an exaggerated degree—extent of oxide penetration by new solder. BELOW: Steel with a 1/1,000-in. aluminum cladding is soldered to form pressure- and leak-tight joint.

Sounding out users of this new aluminum soldering alloy, WELDING ENGINEER turned up generally favorable results. For instance, a large Chicago firm, using the solder in salvage operations on aluminum die castings, reported highly satisfactory results with the 800-F blend (and, more recently, with the 500-F blend). No mechanical cleaning methods or flux were used. A good chemical bond was obtained and no subsequent corrosive action was observed.

Fluxless solder defeats aluminum oxide

By Samuel Freedman, *President*
Chemalloy Electronics Corp.
Santee, California

ALUMINUM'S well-publicized oxide film has created a continuing headache for those who must solder or weld this popular metal. The protective oxide layer develops whenever aluminum is exposed to air.

This film will not disintegrate at temperatures less than the melting point of aluminum itself (1,218 F). But unless this film is penetrated, no soldering or welding is possible.

Despite the difficult-to-penetrate oxide condition, however, aluminum usage should continue to expand because of the metal's notable commercial advantages. As better soldering or welding materials and techniques are made available, applications should increase still further.

One widely used method of exposing clean parent metal for welding or soldering has been to employ corrosive fluxes. There are chlorides and fluorides in these potent fluxes, however, and they must be completely removed after joining or the residue will attack base metal when it is exposed to moisture.

Some Alternatives

Here are other alternatives used by many fabricators:

(a) *Extreme cleaning methods* (including scratching or scraping of the surface;

(b) *Distributing the oxide by vibrating the metal at supersonic frequencies;*

(c) *Using an inert-gas atmosphere during joining—i.e.*, the Tig (tungsten inert-gas) or Mig (metal inert-gas) welding methods, and

(d) *Scratching the surface under a globule of non-adhesive molten solder to keep air out at that point.*

All of these anti-oxide processes obviously involve some high degree of skill or expensive facilities if uniformity is to be attained.

Seek New Method

A program was inaugurated in 1951 for the purpose of simplying the joining of aluminum. Aims of this program, which has been conducted for the past five years, included the development of fluxless soldering; a low application temperature; corrosion resistance; a process allowing the joining of copper or other metals to aluminum; a process applicable with standard equipment and almost any heat source, and a joint as strong as the parent metal.

All of these needs, and others, were resolved by blending a zinc-lead alloy, and forcing the material's homogenization and self-cleansing.

The first developed blend, which had a melting point of 800 F, contained 85% zinc, 5% copper, 8% aluminum, 1½% lead and ½% tin. The alloy possessed tensile strength exceeding 50,000 psi. Copper content, however, darkened the metal.

SOFT solder at left forms into globules and rolls off heated surface of aluminum sheet. Surface tinned with new fluxless solder (right) allows good soft solder bond.

Compromise Alloy

The second developed blend resulted also in better anti-friction properties as well as a lower melting temperature (600 F). A 25,000 psi tensile strength was given by this 87% zinc, 5% aluminum, 5% lead and 3% tin alloy. It is a relatively popular compromise version.

A third blend, illustrated with this article, permits joining very thin-gage aluminum sheets because of its greatly reduced melting point—only 500 F, or about 40% of the damage temperature of aluminum. The blend is comprised of 90% zinc, 7% lead and 3% tin, and tensile strength is over 10,000 psi.

In order to prove successful, the alloy constituents had to homogenize and cleanse, as well as blend. Zinc and lead are incompatible metals; lead seeks to settle and to powderize the zinc.

Adding a small quantity of hydrochloric acid while metals were in the initial molten state provided necessary unity, but techniques had to be developed to prevent a possible explosion during this step.

A special material, flour-like and highly porous, was developed. This powder was impregnated with the acid to yield a muddy paste.

Controlled Reaction

When introduced into the molten metal (following certain techniques in regard to sequences, intervals, quantities and minor additives) it resulted in one reaction per pore per grain of the carrier material. Reaction time corresponded to the length of time unconsumed acid remained in the carrier material pores.

Through this process, a single, violent explosion was safely converted into prolonged boiling and agitation of all contents of the crucible. Intensity of the process is fully controllable to cause good homogenization of zinc and lead.

Non-ferrous residues and other impurities are lifted to the surface in defiance of specific weights of each ingredient. The superfluous material, including all carrier material that has become porous and buoyant at the end of the cycle, is then skimmed off.

The cleaned, homogenized and skimmed metal remaining in the crucible now has three pronounced properties:

1—When formed it is a fluxless aluminum soldering rod in a choice of temperature and strength capacities, depending on blend. It can be rubbed on after parent metal is heated.

2—Two pieces of the alloy in frictional contact can operate for lengthy periods without lubrication or appreciable heat buildup as dry bearing metal.

3—The metal is a multitude of unit-shorted batteries which, in liquids, indicate as much positive as negative electrical potential. It is therefore electrically balanced.

Fluxless Alloy

The small amount of acid used does not remain in the metal except, possibly, in minimum trace form. It has been consumed by volatilization during boiling.

New blends still in the research stage which utilize more tin and lead show promise of bringing melting points down another 100 to 150 deg. This should enable application with standard soldering irons on either aluminum or other metals.

When parent metal is heated sufficiently to melt the alloy on contact, the first action is simple soldering. As the heat is prolonged *(but not intensified)* capillary action takes place in the parent metal.

The alloy travels through and underneath aluminum's oxide film in the direction of greatest metal mass and heat, passing thin-gage metal which is cooler because of less mass and greater exposure to cooling. This natural action prevents burn-through.

Less Skill Needed

Skill in application is of minor importance, and facilities can be elementary. A small, manual torch is a suitable heat source for light work. In emergencies, where even such facilities are absent, acceptable work can also be done by heating parent metal on a hot plate, gas or electric stove burner.

Soldering irons or guns usually give heat that is too localized and insufficiently diffused, preventing optimum capillary action. However, where they can develop necessary temperature on small light parts—and where they are handled in a way that simulates a torch's heat-diffusion area—these heat sources may occasionally be used.

Copper and aluminum may be joined with the alloy. Soft solder which will not ordinarily adhere to aluminum can readily be applied to aluminum tinned with the new alloy.

Tinning requires only minimum capillary action. An ideal bond to serve as a base for soft solder is obtained simply by prolonged heating.

No Friction Trouble

Friction and chafing have posed no problems for the alloy, particularly for that blend which has a 600 F melting point. Salt spray tests at 20% have been withstood for 2,000 hours. After about 200 hours, however, the protective coating forms and further exposure is meaningless.

In order to markedly disturb the alloy bond, it is necessary to upset its inherent electrical balance with a substantial and prolonged unidirectional current unlikely to occur in actual practice.

At any time, the joining material may be melted and reused. It functions also with zinc or potmetal, provided that the blend selected has a melting point lower than the 700 F melting zone of such metals.

The alloy has never splattered or exploded during the course of its five-year development. It will splatter only if a foreign liquid comes in contact with molten metal.

BOTH interior and exterior submerged-arc welds on sub-assembly are made on same welding fixture. Bent copper nozzle *A* assures welding wire entering weld joint at proper angle.

Specialized techniques devised for welding steel crankcase

By Leo L. Young
Cleveland Diesel Engine Division
General Motors Corp.

BECAUSE design requirements for Cleveland Diesel Engine Division's "Model 16-358" engine specified that the crankcase had to be lightweight and capable of withstanding extreme operating pressures, the crankcase was constructed with welded steel forgings.

The radial, two-cycle engine, designed to operate either on diesel fuel oil or natural gas, is used for stationary power generation and for supplying power for different types of marine vessels. It can be operated either in a horizontal or vertical position.

After welded design had been established, the firm's manufacturing process engineer had to devise specialized welding fixtures and techniques (as well as specially designed machine tools) to make possible the most efficient fabrication of a crankcase assembly

Bank Arrangement

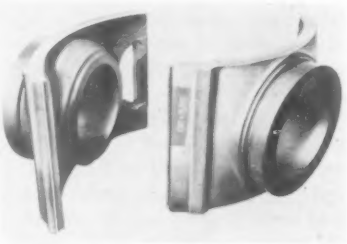
The engine's 16 cylinders are arranged in the crankcase in 4 banks. Each bank has 4 cylinders radially spaced around a forged-steel, four-throw crankshaft. Cylinder-attaching flanges are welded together to form a four-cylinder ring segment sub-assembly.

The loads imposed on the cylinder-attaching flanges necessitate the use of a steel alloy forging having a carbon content low enough to permit easy welding. Desirable heat treating qualities also are needed to obtain required strength and hardness.

Each cylinder head and liner assembly are secured to the crankcase by means of the cylinder-attaching flanges, together with a clamping ring. The inner, or back, face of the circular, cylinder-attaching flange is machined and taper-finished to correspond to similar machining on the cylinder's outer surface.

When the split, two-piece cylinder clamping ring is assembled, tapered surfaces of the cylinder and attaching flanges match the taper of the clamping ring. The ring alone must withstand internal gas pressures created by combustion.

The submerged-arc welding process is used on crankcase sub-assemblies and final assembly. Interior welds, joining four individual cylinder-attaching flanges to form one ring segment sub-assembly, are made with attaching flanges secured to the faceplate of a specially designed positioner.



INDIVIDUAL cylinder attaching flanges.

Welding Fixture

This positioner is an integral part of a special welding fixture developed to facilitate the use of submerged-arc welding for both interior and exterior welds on the four-cylinder ring segment sub-assembly.

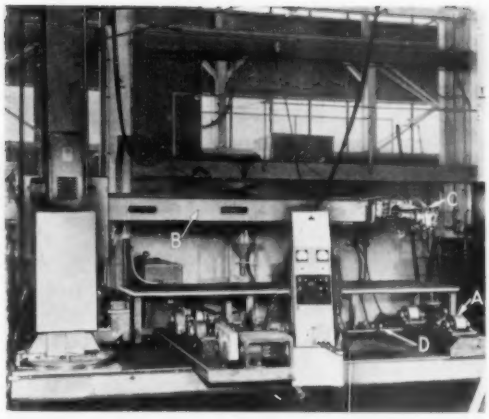
Six interior welding passes, made at 35 volts, 500 amp, at a welding speed of 10 in. per minute, join attaching flanges. To assure proper arc penetration at the beginning and completion of the weld, waster plates are tack welded to each end of the weld line.

Best interior welding results are obtained by preheating the sub-

assembly prior to welding to 450 F. Interior welds are then made.

Before exterior welds are made on the sub-assembly, unfused parent metal remaining at the bottom of the interior weld is removed by using an arc-air torch. An electric arc reduces metal to a molten state; a jet of compressed air then blows molten metal and slag out of the crater.

The operator first strikes an arc to form a puddle of molten metal. Then he intermittently opens and closes an air valve to blow out newly formed puddles of molten metal. After the groove has been cleaned, the interior weld is checked by the magnetic particle inspection method.

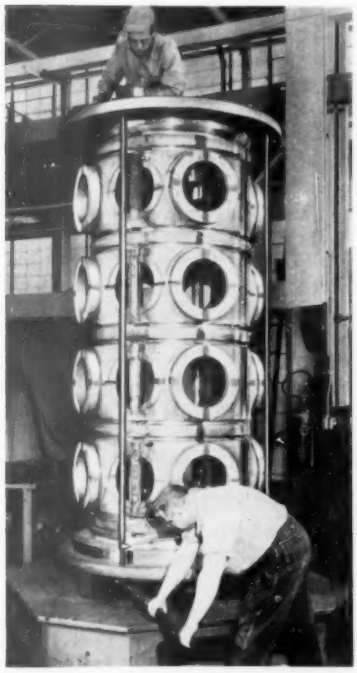


CRANKCASE is supported and rotated on 4 rollers *A* during welding operation. Horizontal arm *B* supports welding head *C*. Horizontal pipe *D* contains natural gas burners to keep crankcase at 450 F preheat temperature.

Unit Recovers Flux

Exterior welds of the four-cylinder ring segment sub-assembly are made in eight passes each at 33 volts, 500 amp, at a welding speed of nine ipm. Flux is manually deposited in advance of the arc. Unused flux is recovered by a vacuum unit mounted near the welding fixture.

After all exterior welds are completed, waster plates are removed and the sub-assembly's circumferential weld-joint faces are machined in preparation for final assembly of the welded steel crankcase.



TRUNNIONS are assembled to crankcase assembly to support it while interior welds are made.

Final assembly consists of four banks of cylinder ring segment sub-assemblies, five main-bearing rings, and a supporting flange, all of which are welded together.

Individual sub-assemblies are assembled into a completed crankcase with the aid of two surveyor's transits set at right angles to each other. Transits assure proper alignment of sub-assemblies and preclude any leaning or tilting of the crankcase. After final alignment is completed, individual sub-assemblies are tack welded together.

Interior welds are made first, followed by exterior welds. Ten weld joints are provided between cylinder ring segments and main-bearing rings. Before interior welds are made, trunnions are assembled to the crankcase assembly to support it in the welding fixture.

Horizontal Arm

The modified submerged-arc welding fixture, which was constructed with standard components, contains a horizontal arm which supports the welding head. The arm is extended or retracted to locate at each interior and exterior weld joint.

Four rolls in the bed of the fixture support and rotate the crankcase during welding. The crankcase is rotated over a horizontal pipe containing 15 natural gas burners which maintain the preheat temperature of 450 F. Initial preheat is made in a pit-type furnace.

The welding fixture's horizontal arm is extended inside the crankcase bore to proper weld location when making interior points. Only one pass is made on each interior weld. This is done with a 3/16-in.-diameter, low-manganese electrode at 32 volts, 725 amp, at a speed of 10 ipm.

After interior welds are completed, they are back-grooved to remove unfused metal and to prepare the crankcase for exterior welds. It is then returned to the furnace to be preheated to 450 F.

Decreased Speeds

A total of 14 exterior weld passes are placed in each of the 10 weld joints on the assembly. The first pass is made at 32 volts, 500 amp, at a speed of 14 ipm. Succeeding passes are made at increased voltage and amperage rates and decreased welding speeds.

While exterior welds are being placed, a number of magnetic particle inspections are made. Needed repairs are performed immediately. A final inspection of both circumferential and longitudinal welds is also made when exterior welding is completed.

A series of four access holes are then flame-cut out of two sides of the crankcase. These holes remove a section of both circumferential and longitudinal welds which are squared off, polished and etched to provide another check for weld quality.

The crankcase, which is stress-relieved at a temperature of 1,050 F, is then sandblasted to prepare it for machining. Welding quality is checked once again by X-ray inspection.

After X-ray inspection it is put through a series of boring, drilling and other machining operations.

Because of its welded design, the crankcase assembly is lighter than a casting, yet possesses physical properties of steel.

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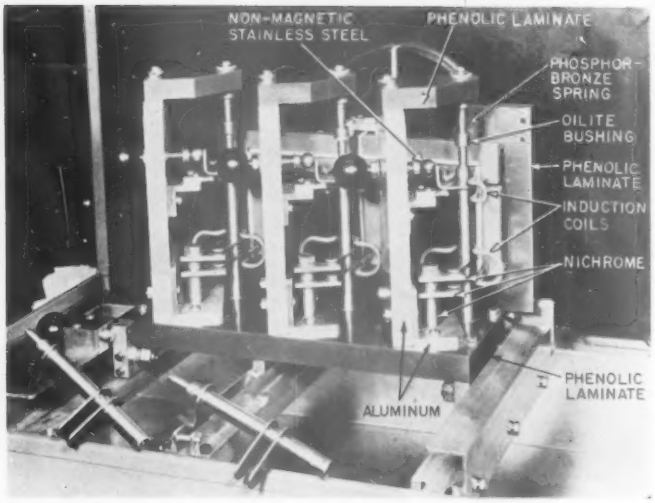

INDUCTION brazing fixture showing selection of materials in relation to their proximity to work coils.

For a fuller appreciation of this thorough study, read Part I in the August issue of WELDING ENGINEER.

Fixtures for brazing—II

By A. M. Setapen
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New York, N. Y.

COLD-ROLLED and hot-rolled steels and cast iron are common fixture materials. However, various high-temperature stainless steels (such as Inconel and Nichrome) offer longer life if the fixture is exposed to open flames or high-temperature furnace operations. Where stainless is used, wetting is avoided by oxidizing the metal.

Ceramic fixture materials also have many applications, particularly in furnace brazing, because of exceptional dimensional stability, stamina under furnace temperatures, resistance to thermal shock and to other deteriorating factors.

There are two basic fixture types: *reciprocating*, which slides or lifts work in and out of the coil, and *conveyor*, mounted on a moving track or rotary table, which carries the piece past the coil.

Since induction coils cause heating by inducing an alternating voltage in conducting materials, fixture design requires precautions.

Insulation, Separation

1. Path of the induced current must be confined to the assembly being brazed. Usually, the fixture should be electrically insulated from ground. In the case of multiplace fixtures, each assembly is insulated from the others as well.

2. Magnetic fields around work coils produce undesired heating of nearby metallic parts. Consequently, metallic fixture parts should be kept out of the work coil field. Separation ordinarily should be no less than ½ of the work coil diameter. Metals used near coils should be non-magnetic. It is best to use ceramics wherever possible.

3. Try to support parts being brazed at points out of the heat zone. This permits wider choice of structural and insulating materials. Springs for positioning should be as far as possible from induction coils.

4. Induction heating is localized, so thermal expansion is confined to a relatively narrow band. In tubular or cylindrical parts, expansion will be largely radial. Allow enough clearance between assembly and fixture to prevent binding at brazing temperatures.

5. Design fixtures for convenient cleaning—particularly near the work coil. Flux is conductive and should be removed periodically to prevent arc-over from coil to work.

6. Avoid play in the assembly or transfer mechanism of the fixture which might cause impact with the coil during transfer or brazing cycle.

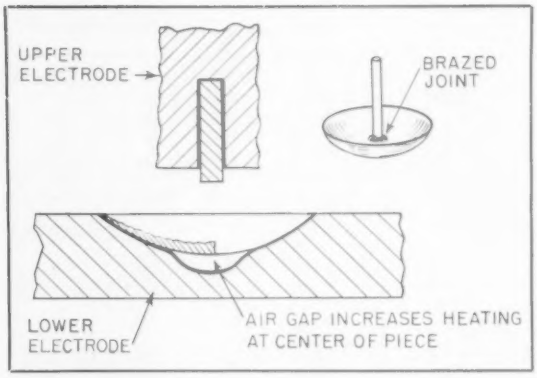
Fixture Materials

Generally, a fixture for induction brazing is constructed of several materials. Three operating factors must be considered in matching each material to its function: dielectric strength, service temperature, and extent of mechanical wear.

Dielectric strength: Fixture must be insulated from ground with a good

Properties of non-metallic brazing fixture materials

Manufacturer	Material	Composition	Max. Contin. Service Temp. deg F	Avg. Coeff. of Expansion microin/in/F	Hardness Moh's scale	Thermal Shock Resistance	Dielectric Strength (step, 60 cycle) volts/mil	Porosity (% moisture absorption)	Remarks
American Lava Corp.	Grade A Lava	hydrous aluminum silicate	2000	1	6	fairly good	80 (¼"-thick disc)	technical vitreous 2-3%)	Available in 10-cu-in. blocks or machined to specs; machinable like brass before firing; hard + dimens. stable after firing; wall thickness ½" max.
	Alsimag 202	cordierite	2280	1	7	fairly good	100 (¼"-thick disc)	porous (10-15%) semi-vitreous (2-7%)	Very hard, mfgr. machines to specs; 8" max. dimension in any direction.
	Alsimag 614	aluminum oxide	2900	4	9	fairly good	300 ¼"-thick disc)	impervious; gas tight	A new alumina material offering high hardness, impact & temp. resistance.
Johns-Manville	Transite	asbestos composition	600	30	no data	fairly good	fairly good if dry	22% (24-hr immers.)	Not ceramic; available in sheet, pipe; primarily facing, backing material; machinable with carbide or high-carbon tools; max. sheet thickness 2"; pipe wall 0.35".
Midwest Dupage Co., Inc.	MDP ceramics	mixed silicates	2600+	3	no data	excellent	no data	porous (above 10%)	Series of ceramics with wide hardness range; machinability and impact resistance, primarily for furnace applications, variety of shapes, max. length 24", width 6", thickness 6".
Stupakoff Ceramic & Mfg. Co.	Stupalith 2110	lithium-aluminum silicate	2350	0.3	6	2300 F to cold water (½" rod)	450 when dry (¼"-thick disc)	20–22%	Available in rods, tubes, strips, custom shapes by extrusion casting, pressing, ramming; can be cut, drilled, tapped with carbide-tipped tools; max. dimensions, 14"; max. thickness, 2". Alumina 1540 comparable to Diamonite; cordierite 1210 compares with Alsimag 202.
Technion Design & Mfg. Co.	Sur-Braze fixture materials	various; cast silicate, fired ceramic; carbon base	2000–3000	various; best 0.4	various; best 9	fair to excellent; best: 2800 F to cold water (½" rod)	various; best 245	various; best 0.03%	Distinct material types for hand torch, furnace, induction brazing. Materials include low-cost castable silicate, compound for short runs or prototype jigs, fired ceramic for precision jigging. Available in standard blocks, rods, tubes, bushings, flats, rounds, etc. Most machinable with conventional or carbide tools.
U.S. Ceramic Tile Co.	Diamonite	synthetic sapphire	3000	4	9+	400 F to cold water (⅛" wall thickness)	no data	impervious to liquids in vacuum	Available in stock tubes, rods, bars, and variety of custom-machined shapes and profiles; extremely wear resistant and hard; can be ground but not machined after firing.
Many mfgrs.	phenolic laminate	fine weave cotton fabric filler; (ASTM Type II–5)	250	10	105 (Rockwell, M scale)	Not applicable	360 (short-time test ⅛"-thick sheet)	½-2% (24-hr immers.)	Good machining, mechanical, electrical properties; available in sheet and prefab. forms.
Many mfgrs.	glass fiber melamine	continuous filament, glass cloth (ASTM Type II)	300	6	120 (Rockwell, M scale)	Not applicable	260 (short-time test ⅛"-thick sheet)	1½-3% (24-hr immers.)	Good mechanical properties; hard to machine; good resistance to flame, heat, arcings; available in sheet and prefab. forms.



SMALL air gap in lower electrode concentrates heat for thicker center section of disc without overheating thin outer edges.

dielectric. Metals used anywhere in a fixture should be nonmagnetic to minimize extraneous heating by the induction coil.

Stainless steel, bronze, brass and aluminum (in order of decreasing toughness) are nonmagnetics commonly used in structural parts and fastenings. Spring materials should be phosphor bronze or beryllium copper.

If a fixture will contact appreciable amounts of water, avoid using aluminum since it oxidizes fairly easily. Fixture metals used close to or in the heat zone are ordinarily such nonmagnetic, high-temperature stainless steels as Nichrome or Inconel.

Metals in supporting coil or fixture must be insulated from ground by mounting on a slab, bushing or spacer fabricated from plastic.

Heat Resistance

Service temperature: Several reinforced plastics are commonly chosen for fixture supports and insulation. Such plastics have poor heat resistance, producing charring and loss of dielectric properties upon repeated heating. Recommended temperature limits for two common plastics—laminated cloth-base phenolic and glass-fiber melamine—are about 250 and 300 F respectively.

Asbestos composition board is an acceptable all-purpose dielectric and heat-resistant material, often used as facing material over less heat-resistant materials. It is susceptible to warping, and large pieces should be mounted on a sturdy backing.

Insulation properties of composition board are reduced by moisture absorption and attack by acid fluxes. Better chemical resistance can be imparted by applying a surface coating of a resistant plastic compound.

Water-cooling the work coil helps reduce heat transmitted from the work zone, and can substantially prolong the life of even poorer than average heat-resistant materials.

Ceramics Preferred

Wearing Properties: Amount of mechanical wear on a fixture or fixture part depends to some extent on the type of brazing operation. Automatic loading is harder on fixtures than manual loading because of higher impact and loading frequency. For wearing qualities, the order of preferred materials for induction brazing is ceramics, stainless steels and plastics.

Because it is difficult to produce uniform current densities in areas larger than $\frac{1}{4}$ sq in., production resistance brazing is usually confined to fairly small light parts. A typical application is the joining of a small pin or stud to the face of a disc.

As a result, fixturing for resistance brazing becomes largely a problem of positioning rather than of supporting parts. This is usually accomplished by drilling out the two electrodes to receive parts and keep them aligned as the electrodes come together.

The upper electrode may be slotted at several points on the lower end to impart springiness to hold the inserted part more firmly.

Limited Projection

In addition to aligning parts, fixture configuration serves another important function: controlling heat at the joint. Amount of heat generated at the joint increases with the length of the conducting path between the two electrodes.

This can be illustrated in the following example. A flat disc must be brazed to four short projecting legs at the lower corners of a thin rectangular crown. The upper electrode, which holds the crown, is cut out to a depth permitting about 0.005 in. of each leg to project below the electrode.

This distance, added to disc thickness, provides a current path which generates the heat needed to braze the four legs without overheating.

The disc, together with a small square of brazing alloy, is positioned in a cut-out drilled in a square of phenolic plastic laminate recessed into the lower electrode. This phenolic square also insulates disc edges from the electrode, so that current path from the four prongs passes vertically through the disc, thus insuring a minimum of peripheral heating.

Another instance in which fixture configuration aids in localizing heat involves brazing a stud to the center of a dish-shaped piece at the point of greatest thickness.

Proper fixture design can materially help concentrate heat at the thick center section, without overheating thin sections. This is done by drilling out the lower electrode to form a hemispheric void below the center of the piece.

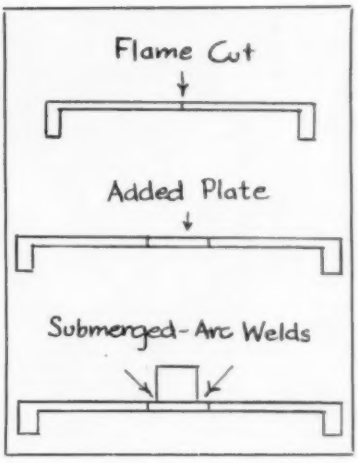
Thermal Insulator

The void causes heat to concentrate in two ways: *(a)* the air gap increases resistance between electrodes in that area, producing more heat; *(b)* the air pocket acts as a thermal insulator, preventing much of the heat from being conducted away from the center piece. Perimeter of the piece remains relatively cool as it rests directly on the electrode, losing heat by conduction.

Fixturing for resistance brazing machines is largely a matter of cutting recesses into electrodes to hold and align the parts.

For most applications, electrodes are copper. Where high conductivity materials, such as silver or copper, are to be brazed, electrodes may be tipped with a material such as molybdenum to produce higher heating.

Phenolic laminates, fabricated into bushings, spacers, strips and slabs are commonly used to insulate electrodes from ground. Although the plastic has only moderate resistance to heat, resistance-brazing electrodes are usually water-cooled, substantially prolonging service life of the plastic and the electrodes.



—*Automatic Welding Co.*

CHANNEL section shown with and without added plate section. In lower sketch, continuously welded reinforcing bars are added to beef-up section. Arrows in lower sketch show position of head to run two seams simultaneously.

Welder and positioner speed production of foundry flasks

WITH THE installation of an automatic, twin-head submerged-arc welder and a special positioner, Sterling Wheelbarrow Co., West Allis, Wis., has taken a bold step toward applying high production techniques to a job shop operation.

The new machines are being used in the manufacture of foundry flasks —two-piece steel frames in which molds are made. The firm receives orders for a variety of sizes and designs which, until recently, were manually arc welded.

Reinforcing Bars

Flasks are developed from special rolled-steel channel sections which are usually split and reassembled with added plate sections to produce any particular size. After these sections are fabricated and welded in long lengths, they are bulldozed into flasks of various shapes and sizes.

Heavy-duty flasks need reinforcing bars welded to the steel channels that make up the walls. Under the old system, the bars were tack welded while held in place by a row of jack screws.

The new positioning machine has a row of hydraulic clamps, each developing a holding pressure of 600 psi. This not only assures a tight fit, but also overcomes deflections and warpage in the steel.

Proper Procedure

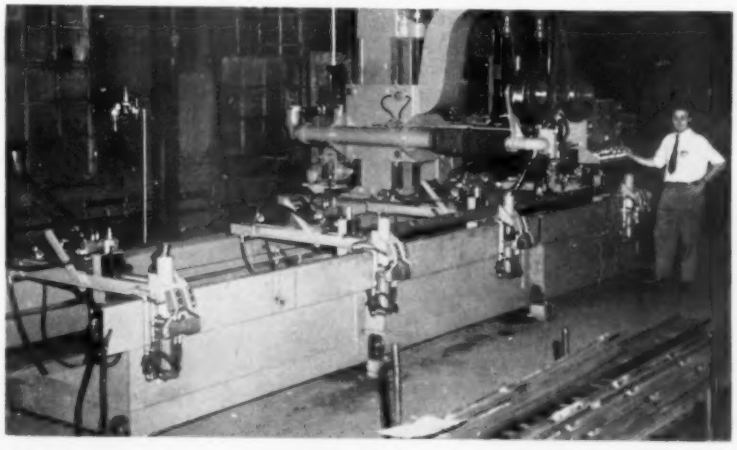
When a weldor completes the tack welds, the clamping arms can be swept clear in one movement. This jig can handle weldments up to 30 in. wide and 22 ft long.

The automatic submerged-arc welder allows two seams to be run simultaneously. The machine's two heads can weld at a rate of 70 in. per minute on butted seams and 50 ipm on fillet welds. This compares with 20 and 22 ipm, respectively, under manual operations.

The accompanying sketch shows progressive alterations of the channel section (with and without added plate sections) and subsequent addition of continuously welded reinforcing bars to beef-up the section. Proper procedure with two machines is said to eliminate distortion produced by the manual arc process.

The welding fixture is approximately 30 ft long and allows a welding range of 28 ft. Welding heads, rams, mast, controls and flux recovery systems are carried on a travel carriage which runs in both directions at speeds ranging from 5 to 70 ipm. Twin rams mounted on a single mast are responsible for the unified positioning of the heads.

Several Wisconsin firms furnished components for the two machines which were reportedly designed, built and adjusted in 18 months at a cost of $70,000.



AUTOMATIC, twin-head submerged-arc welding machine, used in production of foundry flasks, helps standardize a job shop operation. Machine allows two seams to be run simultaneously.

WELDING theory and application as fabricating tool was backed up by periods of practice in welding booths erected in the plant to train and qualify production weldors.

Supervisors and designers turn out for a welding school

By Frank Iapalucci
Chief Welding Engineer
Eddystone Division
Baldwin-Lima-Hamilton Corp.

EDUCATION still offers the best solution to many production problems. This statement is borne out by the results obtained at Baldwin-Lima-Hamilton Corp., Philadelphia, Pa., which conducts a training course for designers and supervisors built around welding as a fabricating tool.

The idea behind this program was inspired by the feeling that over-all plant performance could be improved and maintained by increasing the participating individuals' knowledge of special departmental problems. *For instance, welding could be put to greater use and the work simplified if a more diversified group of employes knew more about its problems and possibilities.*

Success Assured

Working on this premise the company developed a broader welding course, incorporating excerpts from textbooks and other sources to meet the needs of works managers, supervisors, inspectors, design and methods engineers, production and industrial superintendents, and union stewards.

Success of the venture was apparent immediately upon its inauguration; so many applications were received that it was necessary to schedule as many as two classes a day. Many applicants even offered to attend outside their usual working hours.

About 132 persons have already completed training and 36 are now attending classes. These include 2 works managers; 12 general superintendents; 12 assistant general superintendents; a manager of quality control; a foundry manager; 6 design engineers; 6 project engineers; and 12 assistant industrial engineers. The remainder consisted of foreman-supervisors and inspectors.

Different Phases

Each class (usually a group of 10) meets once a week for two hours. The first hour lecture period is preceded by a 15-minute test on the previous week's subject. Following is one hour of practical demonstration of the subject under discussion.

No attempt is made to make welding technicians out of designers and others. The purpose is to provide them with sufficient knowledge of welding techniques to assure their taking full advantage of this fabricating process whenever possible.

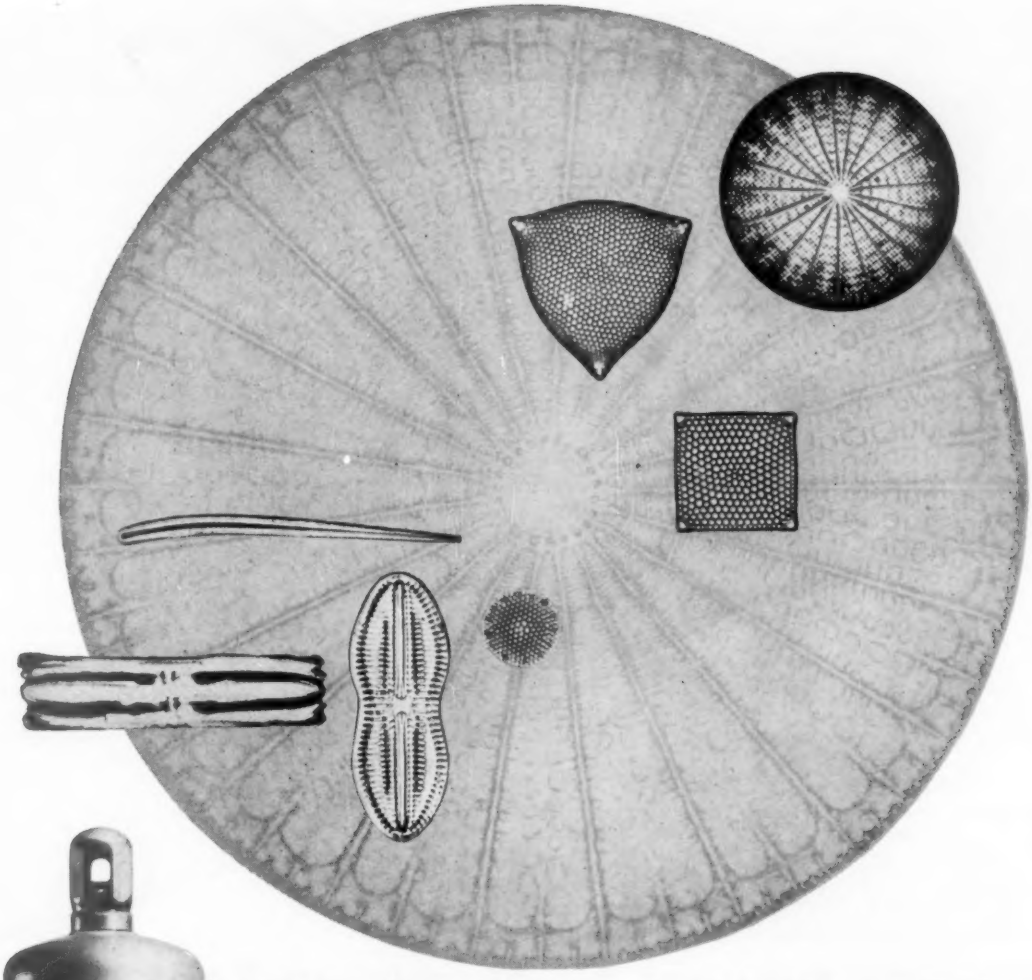
For convenience and easy assimilation, the main subject of welding is subdivided into 12 phases so the course can be completed in as many sessions.

Some of the phases considered include: fundamentals of different welding methods; safe practices in handling welding equipment; AWS electrode classification; common welding difficulties and how to handle them; how to pick the right electrode for the job; cutting, burning and gouging, and inspection—visual, dye-penetrant and X-ray.

Some idea of the complete course's worth to design and methods engineers can be obtained by a review of the facts studied on welded joints. Starting with a description of the fundamental edge, butt, lap and tee joints, and bead, butt, fillet and plug welds, the lecture also covers all variations of these forms.

Before incorporating a welded joint into a design, the student is cautioned to consider: (1) load and load characteristics (whether the load is in compression or tension, and whether bending, fatigue or impact stresses in any combination are present); (2) manner in which the load is applied (whether it is steady, variable or sudden); and (3) cost of joint preparation and actual welding.

As an aid in selecting the best joint for the job, forms and variations are compared to illustrate ad-



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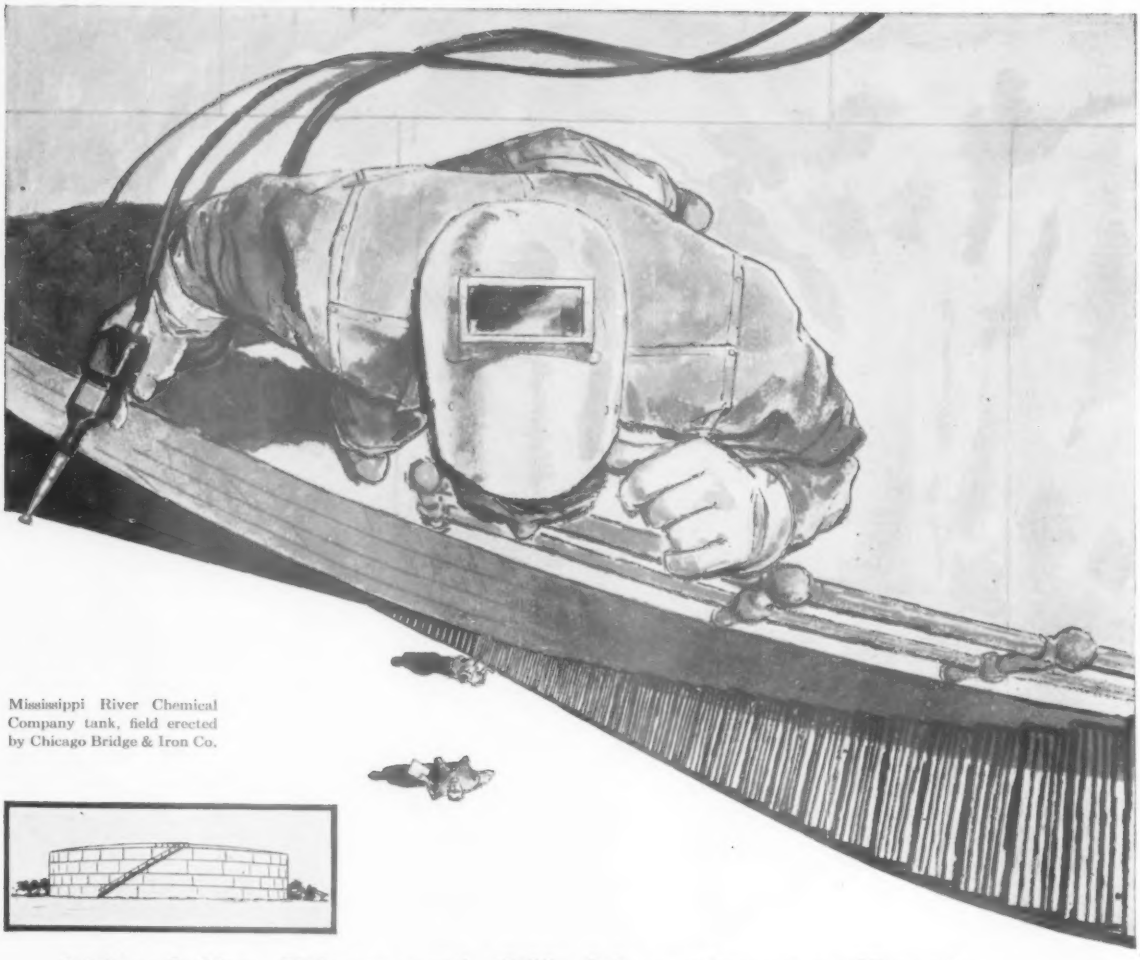

Mississippi River Chemical Company tank, field erected by Chicago Bridge & Iron Co.

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The big job was field erected, using the inert-gas, metal arc-welding process. The bottom course plates are 1⅛ inches and upper courses are progressively thinner, with a ⅜-inch-thick top course. Welds on the finished job were subjected to a standard dye check test. The tank passed this and subsequent water pressure tests with flying colors.

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vantages and disadvantages of each. Another important factor is fit-up of the joint. If fit-up is poor, more electrode material is required and extra time is consumed in making the weld.

Production Costs

Such practical information is invaluable to the designer if he is to keep welding production costs at an optimum figure and know when it is economical to substitute weldments for castings. Furthermore, he is better able to designate the type of weld best suited for a specific job.

Supervisory personnel learned the practical side of welding production: selection of correct electrode material to suit the base metal; requirements of a good weld; determination of the best position in which a weld can be made. They also learned many other facts which enable them to spot welding troubles, operator's faults and unsatisfactory work quickly.

Benefits derived from this dissemination of knowledge have come in the form of dollars-and-cents savings as well as in many intangibles. For instance, through a better understanding of welding possibilities, several products have been redesigned for weldments instead of castings at a saving of $700,000.

This is an end result brought about by smoother cooperation between groups and individuals. A more concentrated effort on everyone's part to put his knowledge to work in his sphere of design or production has resulted in countless individual improvements.

Designers are able to put into production new methods of assembling and welding. This makes for more economical production. Production supervisors can do a more adequate inspection job to assure top-quality work.

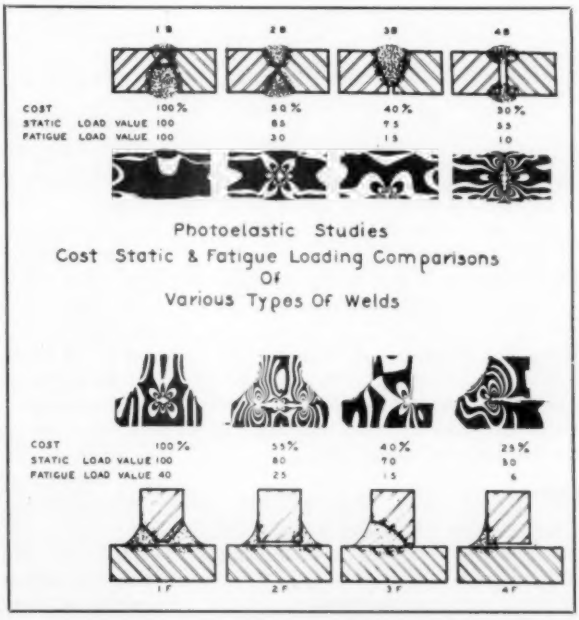
Fabrication problems are minimized with the result that production rate increases. Furthermore, work can be planned more intelligently.

Top-Quality Work

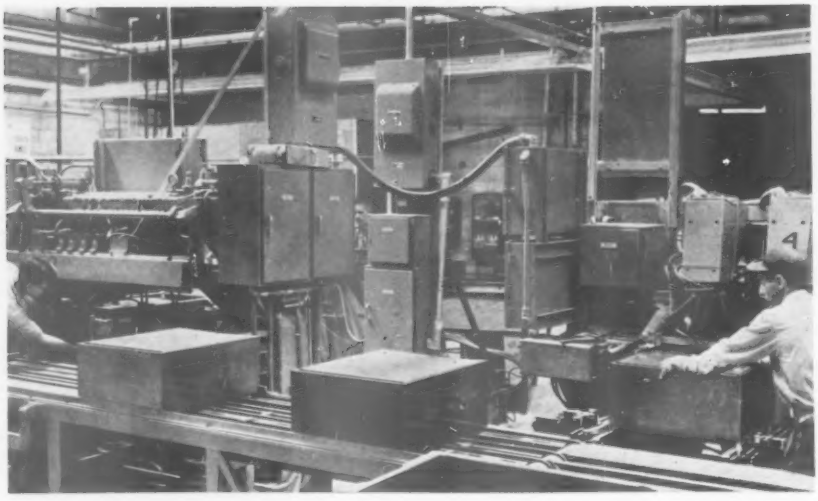
Plant production supervision is strengthened. Supervisors and inspectors are capable of testing new welding equipment and welding rods to determine their ability to do specific jobs.

Relations between design and production departments have improved; therefore, closer teamwork is assured. Finally, costs to customers in all operations allied to welding have been reduced.

Some of the sources of information used in the welding course include: *AWS Handbook; Weldability of Steels,* by R. D. Stout & W. D'Orville Doty; *Welding And Its Applications,* by B. E. Rossi; *Oxygen Cutting,* by G. V. Slottman & Edward H. Roper, and various articles, movies and slides.



TYPICAL of visual educational material used in training program is slide used to illustrate several types of welded joints and to compare cost versus static and fatigue-load value.



TWO of the spot welder's four units are shown here as cabinets move from one to the other on a conveyor.

Welding with a "monster"

AN ELECTRONICALLY-controlled resistance welding machine in Maumee, Ohio, is turning carloads of steel into kitchen cabinets faster than a housewife could clean one with a damp cloth.

Toledo Desk & Fixture Co., manufacturers of the cabinets and a line of bathroom vanities, has affectionately termed its giant spot welder the "monster."

Unique in the manufacture of steel kitchen cabinets, the welder would cost $100,000 and take a year to duplicate. A complete kitchen cabinet can be turned out in nine seconds; at full capacity, the machine can fully spot weld 400 cabinets an hour or 3,200 in an eight-hour working day.

4 Welding Units

The "monster" actually is made up of four automatic welding units, closely interlocked by shuttles, electronic timing controls, relay switches and circuit breakers.

Operated by four men, the machine offers a high safety factor in that one man cannot start his unit until the others have completed their welding operation.

Fully adjustable to weld cabinets from 12 to 81 in. high, 9 to 36 in. wide and 13 to 25 in. deep, it can turn out all or part of every cabinet Toledo Desk makes —wall, base, broomers, pedestals and undersink cabinets. Adjustments from one cabinet size to another average 10 minutes.

Before the machine was conceived, it took 18 men one hour to make 140 cabinets, using 10 manual spot welding guns and eight pedestal welders. Workers had to square the cabinets with jigs, a time-consuming operation, and no two weldors ever welded alike.

Welding Procedure

The new machine eliminates hand setting and hand welding operations. Also, it will not weld until all cabinet parts are perfectly aligned.

Here's how the welding units operate:

The first unit welds door hinge reinforcements to the cabinet sides. The man on No. 2 unit inserts these sides and a back into the "monster." These are held in alignment by automatic positioners which are part of the unit.

He then pushes two starting buttons. This raises air pressure to operating level, and automatically brings positioning clamps into play to hold the pieces in alignment. At the same time, the spot welding electrodes come into contact with the metal.

An electronic timer control starts the squeeze time. Weld time begins immediately after, and the metals are fused together.

The third segment of the timing cycle—hold—keeps electrodes pressed against the cabinet parts until metals congeal. The machine then returns to its original position and stops operation.

Preset Cycles

Squeeze time can be set for 3 to 120 cycles. Weld and hold time may be preset for 3 to 60 cycles.

As No. 2 unit completes its welding operation, a relay switch is tripped. This starts the air-operated shuttle which moves the cabinet into No. 3 unit where again it is automatically aligned.

The man on No. 3 unit inserts the top, pushes two starting buttons, and a weld cycle similar to the one at unit No. 2 begins. When the top is welded to the sides and back, the shuttle kicks the cabinet onto another shuttle that moves it to No. 4 unit.

At this last unit, an operator slides the cabinet into the machine, inserts the bottom, and welds it to the sides and back of the cabinet.

When finished, the four-unit automatic machine has turned out a wall cabinet that is perfectly aligned and welded. The only remaining operation is completed when the cabinet is carried on a conveyor to the last assembly station and the door is screwed on.

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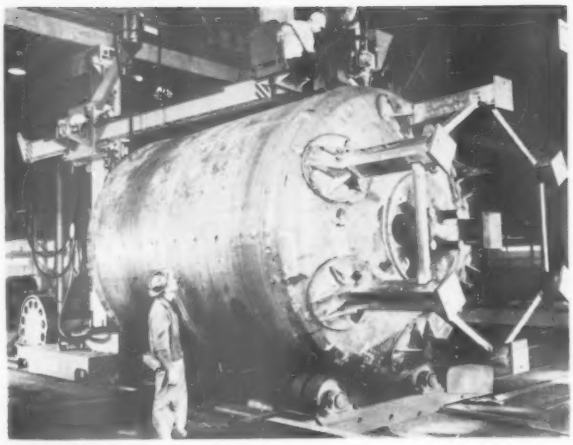
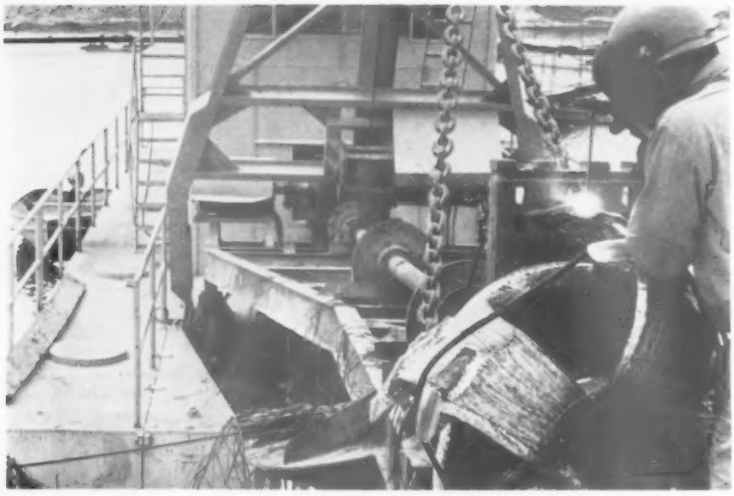


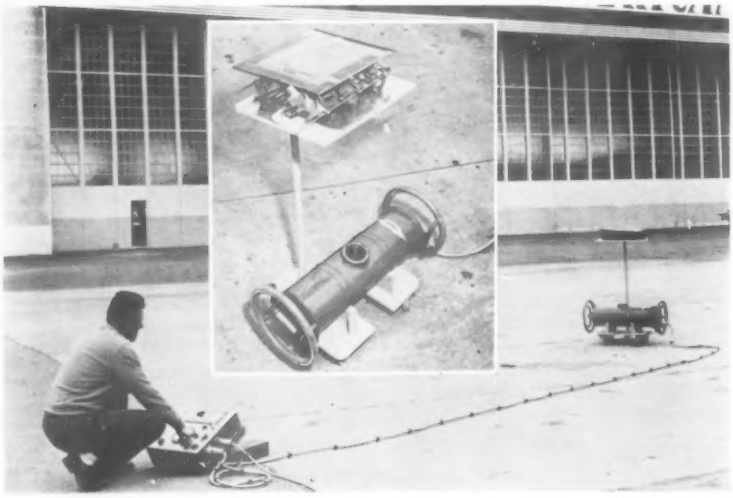
LARGE-SCALE process equipment is fabricated easily and economically at Pittsburgh plant of Dravo Corp., through use of automatic submerged-arc welder and power-driven rolls. The machine operator (top) inspects weld quality as seam is joined on 8,000-gal viscose blender, one of four manufactured for rayon producer.



FEW hours a week keep this sand sucker cutting head in condition to mine heavy minerals (rutile, ilenite, zircon, etc.) in Florida waters. Weldor uses 5/32 and 3/16-in. hardfacing electrodes to top off buildup. A 250-amp engine-drive welder supplies power ranging from 130 to 200 amp for the work on the 1-in. steel blades and manganese steel teeth. Teeth are 3 in. wide, 8 in. long, 2½ in. thick at the blade. After about six months, cutter heads must be taken to shop for complete rebuilding.

—*Hobart Bros. Co.*

WELDOR William Smith of Chicago's Bureau of Engineering uses E6010 electrodes to tack weld loose areas in cast steel rail of famous Michigan Ave. bridge. Work is part of temporary safety repairs on bridge, which is scheduled for a new deck of concrete.



—*Holger-Andreasen, Inc.*

WELDS on rocker box covers from Pan American World Airways planes are checked by X-ray method. Covers, subject to chafing, may develop cracks or oil leaks. PAA uses X-ray inspection on other welded joints and on radiators, cylinders and fuselage structure.

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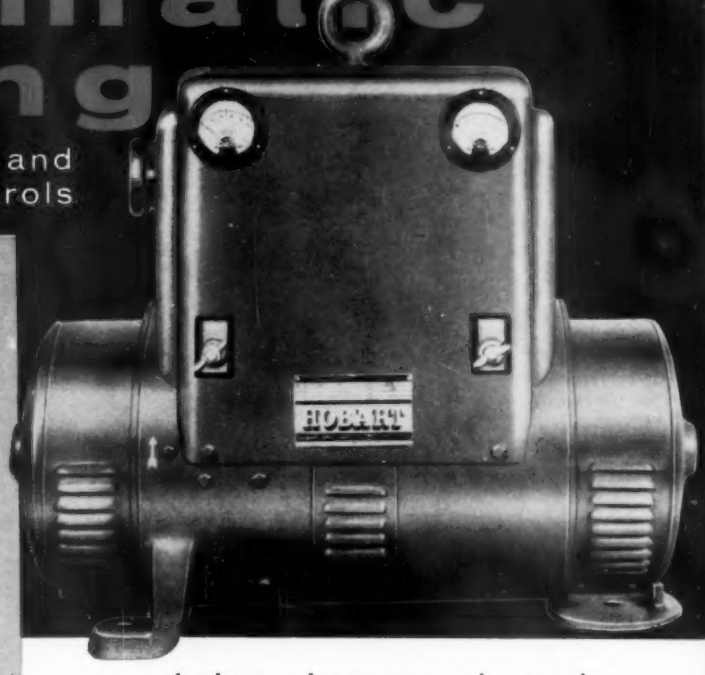

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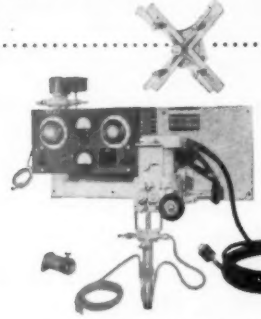

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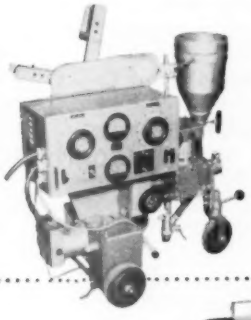

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Aluminum cable's first-year performance

By Ray L. Townsend, *Tweco Products, Inc.*

CUT-AWAY shows solid and dense soldered connection of aluminum welding cable to copper lug.

IN THE FIRST year of aluminum welding cable's introduction to the market, it must be admitted that some problems have been encountered.

Wherever difficulty has been reported, however, the problem has been traced to the use of undersized cable, poor or improper connections, or general abuse which has always plagued users of welding cable.

Wherever proper procedures concerning installation have been followed, results have been more than satisfactory.

Basic Problem

The main problem in introducing aluminum welding cable has been to get the user to treat the conductor as aluminum and not copper. The two metals have distinct properties which must be recognized if best results are to be achieved from either.

Unless it is protected, a non-progressive (non-conducting) oxide coats the surface of aluminum when it is exposed to the atmosphere for a short time. Copper, however, is subject to continuous progressive oxidation. Its coating is a semi-conductor.

Recognizing this oxide condition and taking proper steps to remove it from aluminum strands at the time of making a cable connection have been major parts of the training program with those using the product. The brush or dipping application of zinc chromate paste at the point of joining with mechanical connections handles this situation.

Either mechanical brushing or anodizing of bared cable ends before connection is also satisfactory. The mechanical joint must be pulled down snugly while cable strands are free from oxide to assure highest conductivity.

Selection of the right conductor size is another important factor. *For manual welding it is necessary to use an aluminum cable one American Wire Gage (AWG) size larger than a proper-size copper cable to offset the deficiency of the lighter metal when compared with copper.*

Extra Current

Aluminum by weight carries in excess of 200% the current that copper will transmit at equal temperature rise. When aluminum (which is one-third the weight of copper) is reduced to the AWG size of copper, its comparative capacity on this basis is slightly over 60%.

Aluminum's higher thermal heat transmission rate, aided by the intermittent duty cycle of manual welding, permits a 20% addition to the carrying capacity. This adds up to 80%-plus overall efficiency of aluminum welding cable in comparison to copper welding cable of equal AWG size.

Aluminum is no cure-all for welding troubles that have always been with us. It does, however, provide desired lightness and flexibility to the highly-skilled, highly-paid workman who must often labor in cramped positions or perilous places.

Soldered Joint

The belief that a good soldered joint in aluminum could not be made has been refuted. True, aluminum welding cable cannot be soldered in the same manner as copper. Care must be given to select a solder made for the lighter metal, and flux must be non-corrosive to the joint.

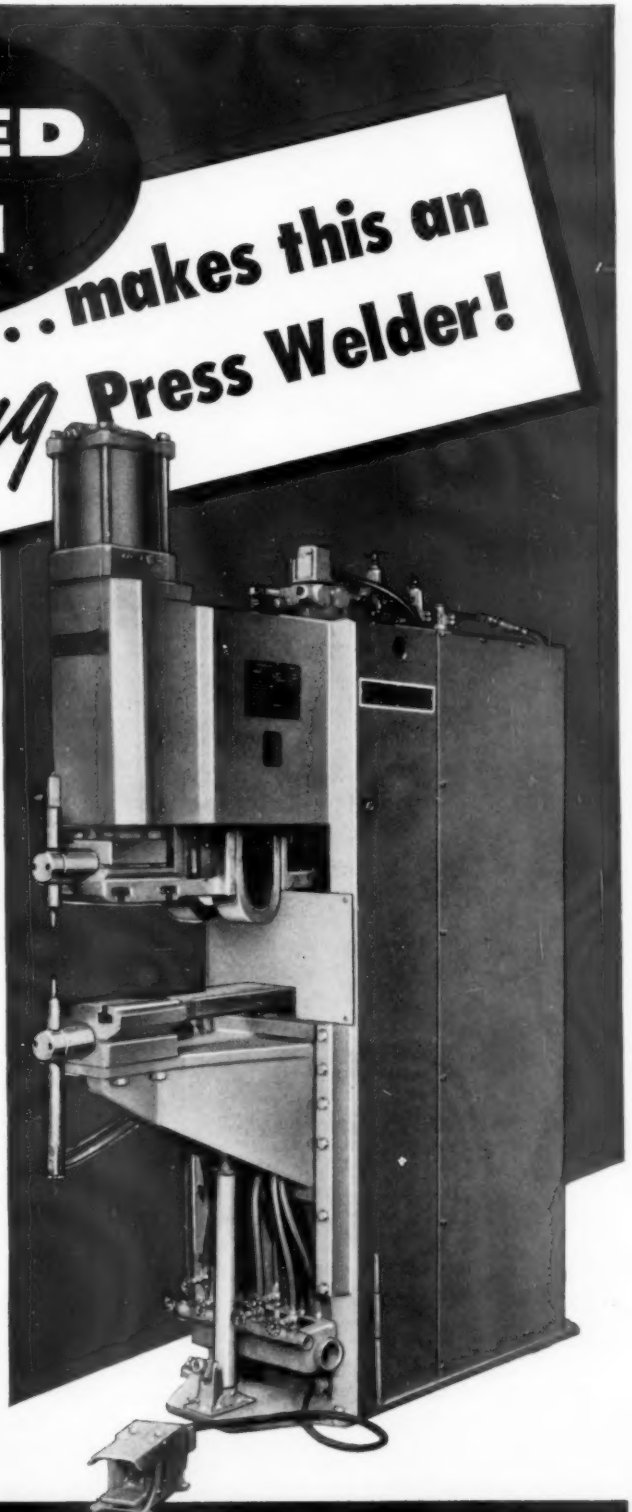
When proper materials are used, non-corrosive soldered joints on aluminum welding cable can be made whether it be attached to a copper lug, an aluminum lug, or a brass or copper accessory.

Small heating torches or electric tongs provide soldering heat. No tinning of cable or lug is necessary; the flux accomplishes this as it is melted with the solder.

An important factor in introducing aluminum weld-

ADVANCED DESIGN

Outstanding . . . . . makes this an Press Welder!



FOR FASTER, EASIER, MORE ECONOMICAL SPOT OR PROJECTION WELDING

- R.W.M.A. sizes 1, 2, 3 and 4.
- Low friction Roller Head.
- NEW, instantaneous follow-up.
- Non-corrosive air cylinder with adjustable stroke deceleration valve.
- Easily adjustable, combination horns and platens. Universal alignment.
- Longer stroke, insulated ram assembly.
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RESISTANCE WELDER MANUFACTURERS ASSOCIATION RWMA MEMBER

IT PAYS TO WELD

PROGRESSIVE *Welder Sales Company*

915 Oakland Avenue • Pontiac, Michigan

To make a good soldered connection . . .

AFTER dipping solder in non-corrosive flux, operator inserts it in lug socket. Keeping flame low to avoid overheating, he fills socket two-thirds full of solder.

ONE inch of cable jacket has been removed, exposing strands. Keeping solder molten, operator works strands into socket where flux cleans and tins them.

FLAME pointed at bottom of lug prevents burning jacket as cable is inserted completely into socket. Excess flux can be washed off with water.

ing cable to the user is a full understanding of its property of expanding approximately 35% more than copper when heated. This is the basic reason for installing a sufficiently large-size cable to assure cool running.

A hot joint that expands and contracts will, in time, loosen and cause heating until retightened. The user of aluminum cable can use a cable one size larger than copper and still put only about half the weight in the weldor's hand.

Whips Eliminated

Aluminum's light weight also eliminates need of smaller-size whip cables. Such cables are a source of heating which often results in hot holders, blistered hands and burned-up tools

Use of a full-size cable right up to the holder, though less in weight than the smallest copper whip cables used, permits a fast escape for thermal heat built up in a holder run at high heats and used over hot work

Heat that is built up in the holder during arc time (due to overloading of the tool, a poor cable connection, or absorbed heat from the hot work) endeavors to escape by the easiest or most conductive route.

The first escape route is back into the welding cable where it eventually dissipates through the rubber jacket on the cable. If the cable is too small, the heat builds up in the holder. A large cable provides a greater Btu reservoir for dissipating the heat from this point of highest temperature.

Electrode Holder

Welding cable usually breaks directly behind the connection at the holder. Testing of the connection at the electrode holder has uncovered some obvious conclusions that have often been overlooked by welding personnel.

In connecting aluminum welding cable to the electrode holder, it has been found that leaving 1 in. of bare conductor right behind a mechanical or soldered connection will permit twice as many reversals or manipulative bends of the strands by the weldor before breakage.

This same condition is true with copper welding cable. The 1 in. of bared conductor, which is stranded and twisted in manufacture, permits flexing with lessened bind that doubles joint life before breakage.

Further testing has indicated greatly lengthened connection life at the holder if torsional load is taken off the cable directly behind the holder connection. This is done by driving special wedges in back of the holder handle, causing cable to be tight as it emerges from the handle.

Another method is to build up a 1-in. section with rubber tape over the rubber jacket of the cable just before it leaves the holder handle. The build-up should cause a slight forcing of the handle over it and onto the holder body for fastening.

Torsional Load

By transferring torsional load to the complete cable outside the holder handle, connection life at the holder can be increased as much as five times over ordinary connections with no torsional protection.

As for galvanic action around salt water, the main problem has been one of trying to use copper or brass connections with an aluminum conductor. When these two dissimilar metals are put together and mixed with salt water or atmosphere, a battery condition is created. Aluminum emerges as the loser in such a marriage.

The answer is: "'*Don't mix your metals around salt water.*" An all-aluminum circuit will be more successful in salt conditions than an all-copper circuit. Aluminum by itself in salt water will stay bright in comparison to copper's high corrosion rate.

The fine stranding of aluminum with its 1,000 F-plus melting point has not lent itself well to thermit welding though experiments with this process are being carried on.

At the start of the second year on the market for aluminum welding cable, acceptance of this new material has been rapid enough to cause several cable manufacturers to start production. The solution of early problems points the way to probable greater use of this lightweight, flexible and lower-cost product.

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WELDING EQUIPMENT

choice of America's leading industries

Pandjiris 7500 lb. positioner in operation at

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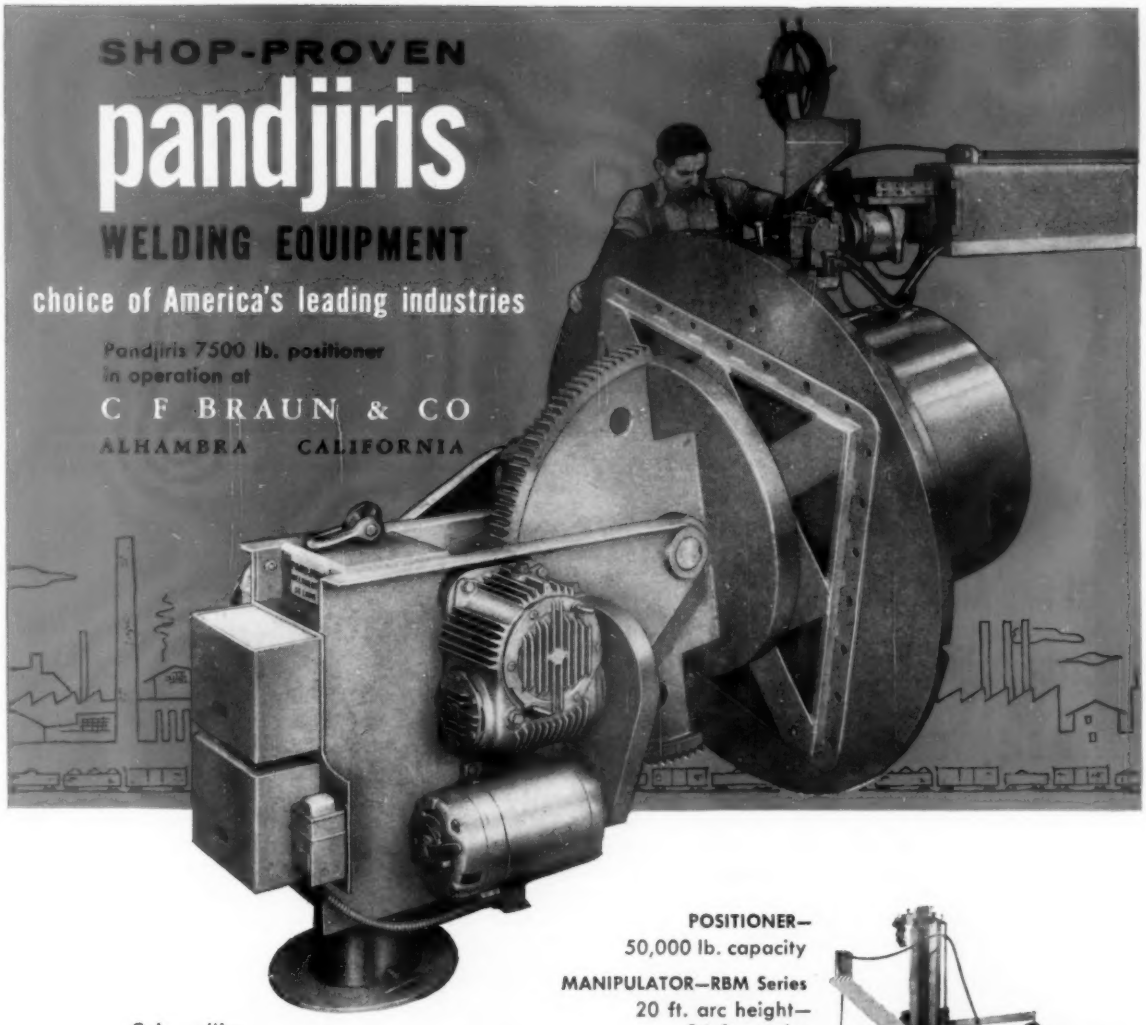
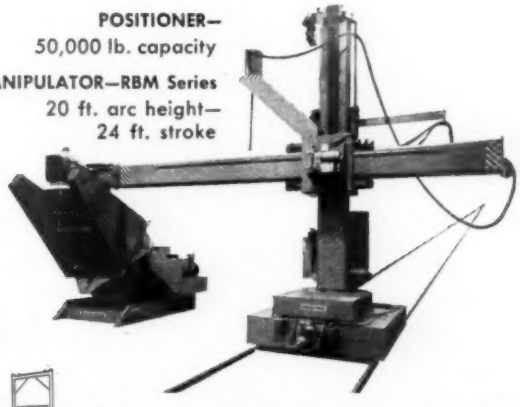
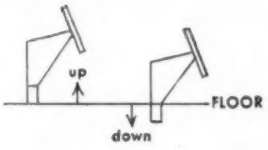


POSITIONER—
50,000 lb. capacity

MANIPULATOR—RBM Series
20 ft. arc height—
24 ft. stroke



Column "in floor mounting" with manual or hydraulic lift 360° rotation



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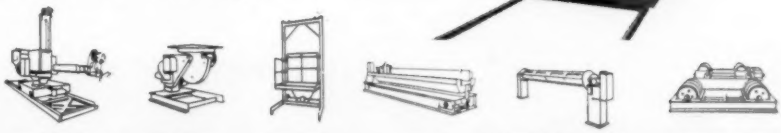
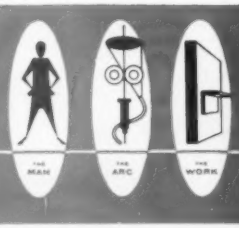


manipulators positioners weld-evators seamers head & tail stocks turning rolls



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efficient positioning of all three

"I like Airco 78E Electrodes because slag is so easy to remove"

Easy slag removal is just one of the many advantages of Airco 78E electrodes. This deep penetrating, all position electrode produces high quality weld metal which sets up rapidly. It is free from porosity, even when welding in the vertical down position. Especially recommended for welding mild steel where high ductility and tensile strength are essential.

This is but one of many electrodes in Airco's complete line that also includes stainless steel, hard-facing, cast iron, general and special purpose electrodes. Send for the free Airco Electrode Guide which will help you select the right electrode for your specific job. Request catalog 1318-WE.

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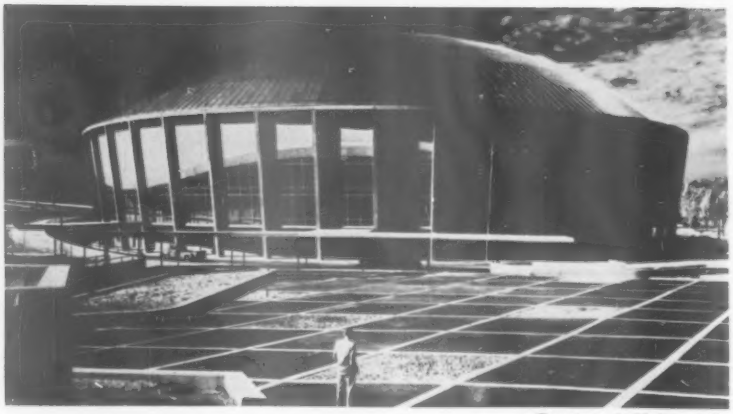


—Courtesy A. M. Byers Co.

DRAMATIC photo of Charlotte coliseum. All-welded dome is world's largest.

Charlotte completes its welded coliseum

IN ITS NOVEMBER, 1955, issue, WELDING ENGINEER devoted its cover and three inside pages to photographs and an article on the welded fabrication of the Charlotte, N. C., municipal coliseum. This $5-million structure, which boasts the largest dome (335 ft in diameter) in the world, has just been completed.

Some 21 tons of E6010 electrodes were used in both shop and field welding on the giant coliseum. In the roof alone, there are 2,664 major welded connections.

Cantilever construction of the coliseum gives an unobstructed view to the 13,500 persons who can be seated inside. Supporting the entire weight of the dome are 48 reinforced concrete columns, each 53 ft high.

A tension ring which circles the tops of the columns absorbs the outward thrust of the dome. This ring is 32-in. by 2-in. steel plate, reinforced lengthwise by two parallel strips of 12-in. channel steel, a 6-in.-wide flange beam, and a 4-in. by 3½-in. angle bar. There are 96 butt welds in the tension ring.

More than 17,500 ft of piping was installed in the coliseum for underground water and steam lines, ground-level return lines, downspouts and ice rink brine lines. Ten pipe sizes were used, from ½ to 4 in. in diameter. Wrought iron was chosen for use in brine lines because of its corrosion resistance. The ice rink area is 202 ft long and 85 ft wide.

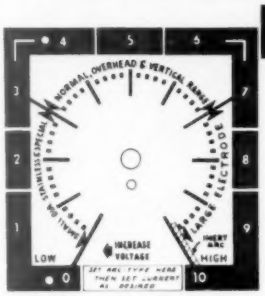
Coupled with an auditorium of conventional masonry and stone construction, the coliseum will be part of a huge, all-purpose civic center for the people of Charlotte and visitors from neighboring cities and towns.

INTERIOR view shows 160-ft radial ribs supporting dome and wrought iron brine pipe installation on floor for ice rink.

ONLY THE

VICKERS* Controlarc DC Welder

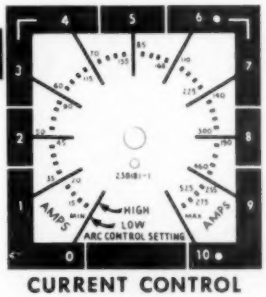
OFFERS ALL 3 OF THESE ADVANCED FEATURES FOR MORE VERSATILE AND MORE RUGGED WELDING PERFORMANCE



ARC CONTROL

1 SELECTION OF ARC TYPE required for vastly different welding jobs, and adjustment necessary to suit the individuality of the operator and the welding job.

2 DUAL CONTINUOUS CONTROL in a rectifier machine. Can vary the current from minimum to maximum, and vary the type of arc, in continuous stepless self-indicating dials.



CURRENT CONTROL

3 REMOTE CONTROL of both these functions in a handy box that plugs into the front of the welder can save floor space by mounting welder out of precious production area.

FOR THE HEAVY CONTINUOUS PRODUCTION JOB—THIS WELDER CAN "TAKE IT"!

Plus these Additional Optional Exclusive Features

CONSTANT POTENTIAL (CP) ADAPTOR

Instantly converts standard welder into multi-purpose CP source, for automatic or semi-automatic Consumable wire inert gas, or heavy flux automatic arc welding. Combination retains all its ideal features for Tungsten Inert gas jobs and manual metallic electrodes.

SLOPE CONTROLLER

Permits automation of many Tungsten Inert Gas jobs which previously had to rely on manual skill—by providing precision stepless control of starting UP (or down) SLOPE, and crater elimination DOWN (or up) SLOPE with individual adjustment of time and current (or percent of welding current). Practical precision timing from near instantaneous to as much as 21 seconds of both slopes. Inquiries on your particular slope controller applications are invited.

*TRADEMARK

WRITE TODAY for Complete Information on this Outstanding Welder

VICKERS ELECTRIC DIVISION

VICKERS INCORPORATED a unit of Sperry Rand Corporation

1851 LOCUST STREET • SAINT LOUIS 3, MISSOURI

TRUCK crane with long boom and jib was used to hoist sections for all-welded, 7-story building.

—Lincoln Electric Co.

To achieve rigid framing and to permit matching of floors in an adjacent building without bulky connections . . .

Department store has all-welded design

THE NEW all-welded, rigid-frame Harvey's Department Store in Nashville, Tenn., was erected in just 53 calendar days. Approximately 420 tons of structural steel were used in the 7-story building.

Shop welding of column stiffeners, angle seats, column diaphragm plates and clip angles with iron-powder electrodes speeded field erection work. The job was handled by a seven-man raising gang and a four-man welding crew.

Spandrel Beams Used

A welded design was selected to achieve rigid framing for wind resistance and to permit matching of floors in an adjacent building without bulky, bolted connections. Savings in both material and labor resulted from the welded design.

Connections between cross beams and columns are of rigid-frame design, carrying full beam strength through the column both in moment and in shear. Spandrel beams along the sides are attached semi-rigidly in a simple beam design by welding beam webs at the center to diaphragm plates which are welded flush with column flanges.

Two rows of "field" or floor beams run the full depth of the building. They are carried through cross beams by welded angles at web junctions, welded tie plates on top, and supporting T-seats slightly wider than the floor beam flange.

Heaviest beam-to-column joints are at the main floor level. Here the beams themselves were built up by shop welding 16 by $1\frac{3}{4}$-in. flange plates to a $14\frac{1}{2}$ by $\frac{7}{8}$-in. web plate. This is too heavy for a conventional rolled mill section.

Flanges are beveled 45 deg at the column junction, making a single-vee joint which is welded from the top. The web, which is not beveled, is welded to the column with full-length welds on both sides.

"Mousehole" in Web

The column is a 14 in. (flange width), 176 lb rolled section. There is a "mouse-hole" cut out in the lower corner of the web to allow a continuous weld through the lower flange joint. It also serves as an opening for

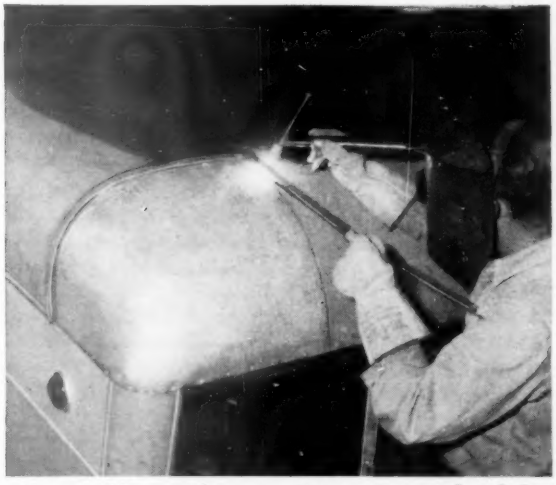
OPERATOR is welding cross beam web-to-column flange. Spandrel beam, at right, is simple semi-rigid beam.

ALL COLUMN stiffeners are $\frac{7}{8}$ in. plate, beveled 45 deg along contact edges and welded in downhand position.

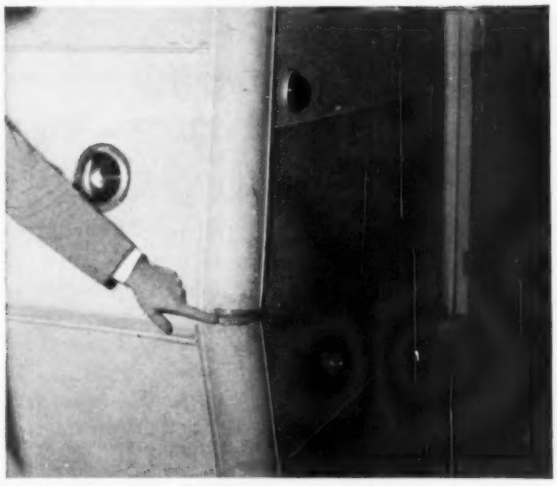
One operator completes 200 feet of welds a day

Fast Braze Welding with smooth-flowing Everdur*-1010 Welding Rod makes sleek, tight roofs for American Coach Co. "Mobile Homes"

THIS AMERICAN COACH COMPANY "Mobile Home" will house four people.



Braze welding a roof corner on 19-gage zinc-coated steel. One operator welds, grinds and prime-coats 200 linear feet of joints in a day.



Rear wall corner of 24-gage zinc-coated steel, also braze welded. The 22 corner sections needed for a day's production are completed in one hour.

Eleven big "Mobile Homes" a day come off the production lines of American Coach Company, Cassopolis, Michigan, and Newton, Kansas. On the roof of each, four corner segments are braze welded by the inert-gas tungsten-arc method, using filler rod of Everdur-1010, one of Anaconda's well-known copper-silicon alloys. Two rear corner posts are also braze welded in the same way.

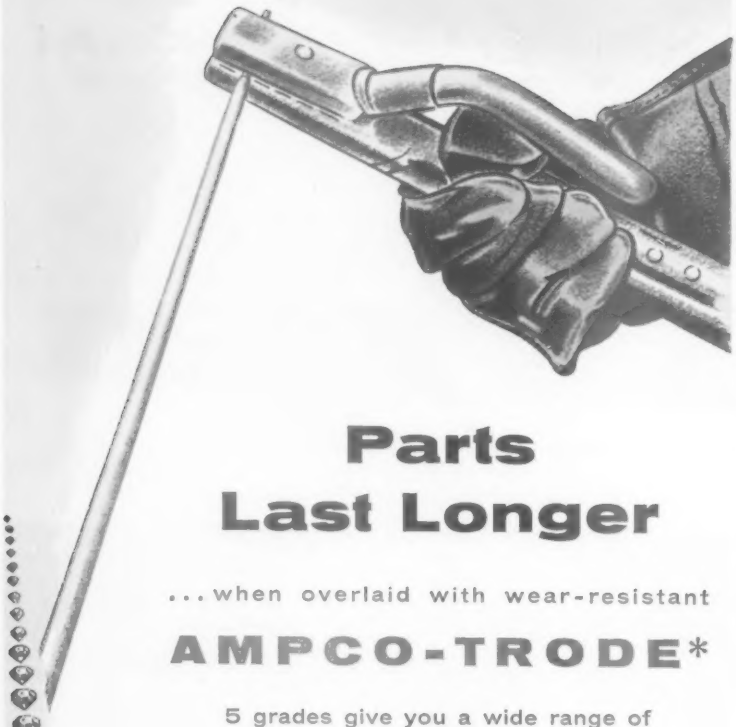
"We prefer Everdur rod," says M. E. Wickersham, vice-president in charge of engineering and production for American Coach Company, "because it flows easily and enables our operator to weld rapidly—and because the welds are resistant to corrosion at these critical points. High welding speed means a minimum total heat input and, therefore, the least distortion in the metal and the least effect on the galvanizing."

Besides helping to make smooth and strong roofs, these Everdur braze welds help to keep them waterproof, for Everdur is nonrusting and highly resistant to many types of corrosion.

Everdur-1010 is one of nine Anaconda Welding Rods finding ever-increasing application in production and repair work. Anaconda Welding Rods are available from distributors throughout the United States and Canada. For help in selecting rod, see your distributor or write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 56110

*Reg. U. S. Pat. Off.

ANACONDA® **WELDING RODS**



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AMPCO-TRODE*

5 grades give you a wide range of "diamond-like" deposit hardnesses

You get an overlay with remarkably long life in severe metal-to-metal wear applications, when you use Ampco-Trode electrodes. They are available in a wide range of deposit hardnesses resistant to all forms of wear — sliding wear, erosion, cavitation-pitting, and corrosion.

In some applications, Ampco-Trode increases service life 5000% over other materials. You can apply Ampco-Trode by most any process—metal-arc, carbon-arc, MIG, TIG, or submerged-arc.

Add extra life to bearings, bushings, sheaves, gears, pinions and many other parts. Stock all five grades of Ampco-Trode electrodes and have a variety of deposit hardnesses on hand.

Write for Bulletin W-17.

Ampco-Trode Grades	Electrodes & Filler Rod	Deposit Hardness Metallic-Carbon-Arc	Deposit Hardness Inert-Gas
	Ampco-Trode 10	130-150	160-190
	Ampco-Trode 160	150-170	190-220
	Ampco-Trode 200	180-220	250-280
	Ampco-Trode 250	230-270	310-340
	Ampco-Trode 300	280-310	350-380

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THE METAL WITHOUT AN EQUAL

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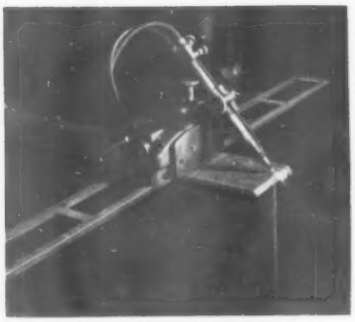
W-141



OXYACETYLENE torch is used for beveling flange of a main cross beam.

a handling cable sling.

An unusual joint connects the spandrel beam which rests on an angle seat welded to the column. A framing connection is made to the 8 by ½-in. diaphragm plate, which is welded to the column flanges, by bolting to a drilled angle outside the beam.

The only weld made in this simple beam connection is between this plate and the beam web on both sides. The spandrel beam here is a 21 in. WF, 62 lb section; cross beam has a 30 in. flange width.

Reason for semi-rigid connections on spandrel beams, according to structural designers, is that full strength and bulk of a rigid-frame connection is not needed to satisfy load conditions.

Furthermore, it will more readily permit future additions or extensions to side walls. Such a joint also can be made in less time.

Floor-Beam Joints

The third type of joint mentioned is that of floor beams to cross beams. The top tie plate is 1 in. thick, fillet welded to both lengthwise floor beams and to the heavier cross beam.

Top flange of the floor beams is cut out so that webs fit up snugly against the cross beam. Framing angles on either side are 3 by 3 by ⅜ in. and 8 in. deep, with a ¼-in. fillet welded around them. Top tie plate is tapered at the ends for most effective distribution of stress across the joint.

There are bottom tie plates under the lower flange of the floor beam which are eventually fillet welded to the lower flange. They give additional strength through the joint. By such rigid connections on floor beams, some of the load can be taken off outer spandrel beams.

An example of how column stiffeners are positioned and welded into

columns is shown in an accompanying illustration. Inserted plates are ⅞ in. thick, flame-beveled at either end and on one side at a 45-deg angle.

Welds are made downhand, using an iron-powder E6024 electrode which permits an increase in normal travel speed of around 25%.

Welding Transformer

The same electrode was used on most downhand field welding, using a-c current supplied by a 500-amp welding transformer. Two of these were used at the building site, along with two 350-amp. d-c motor-generators for vertical and overhead joints on which a conventional E6010 mild steel coated electrode was employed.

In heavier welds, such as main floor beam-to-column connections, an E6027 iron-powder electrode was specified.

The setup for flame-beveling beam flanges is a conventional oxyacetylene torch arrangement with an electrically-driven carriage on a track. Air chiseling deburred the web edges.

Architects for the structure, Marr & Holman of Nashville, decided upon a rigid-frame welded design for a number of reasons.

First, the erection method was entirely noiseless—a public relations advantage in a central downtown area.

Floors To Align

Second, the building adjoined an older structure belonging to the Harvey Co. It was desirable to have floors of the new and old buildings align. Bolted connections were thought to be too bulky and might have prevented good floor alignment, in addition to reducing headroom in the new building.

Fabrication and erection of structural steel were handled by Englert Engineering Co. of Nashville. General contractor was the Sumner Construction Co.

In figuring the job, Englert concluded that the all-welded, rigid-frame design would reduce the amount of shop detailing and fabrication by some $10 a ton over bolted or riveted connections.

This permitted a lower bid on fabrication and erection. The welded design also permitted an appreciable saving in over-all steel requirements.

Contributing to lower cost for the fabricator was the use of iron-powder electrodes for faster downhand welding.

Light weight torch cuts 4" steel-*FAST*-at low pressures

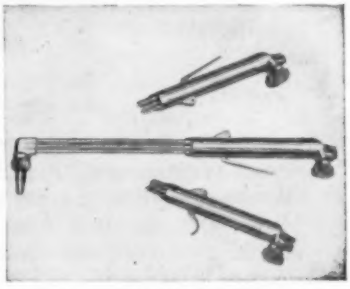
SMITH'S **Silver Star☆ CUTTING TORCH**

This is a light torch—only 2 lbs. 9 ozs. for the 20½" length. But, the way it cuts thick steel at low gas pressures is something to see. Eight pounds is all you need to cut up to ½" steel. For heavier cuts, pressures are proportionately low. Oxygen consumption reduced by 50% in some cases. That's real economy!

Another thing: You don't need a wrench with this torch! Tips slip into torch head, tighten with twist of fingers. That's a time saver! (Special Smith patent.) Lever Over Handle, Lever Under Handle, or Trigger — you have all 3 in this one torch to suit all operator requirements. Ask us for complete details on this sensational new cutting torch.

Only 8 lbs. gas pressure cuts ½" steel

Observers can't believe their eyes when they see this new Smith's Torch cutting ½" steel with only 8 lbs. oxygen pressure. Look at the gas you save! This torch costs less to operate.



Saves up to 50% oxygen

That saving counts up over a period of time! Even heavy cuts up to 10" take less gas than ordinary equipment. This torch is versatile and economical. "Burners" told us what they wanted and we built those features into this torch.

See us at Booth 83, AWS Welding Show, Buffalo, N. Y.

Full information on request — mail coupon

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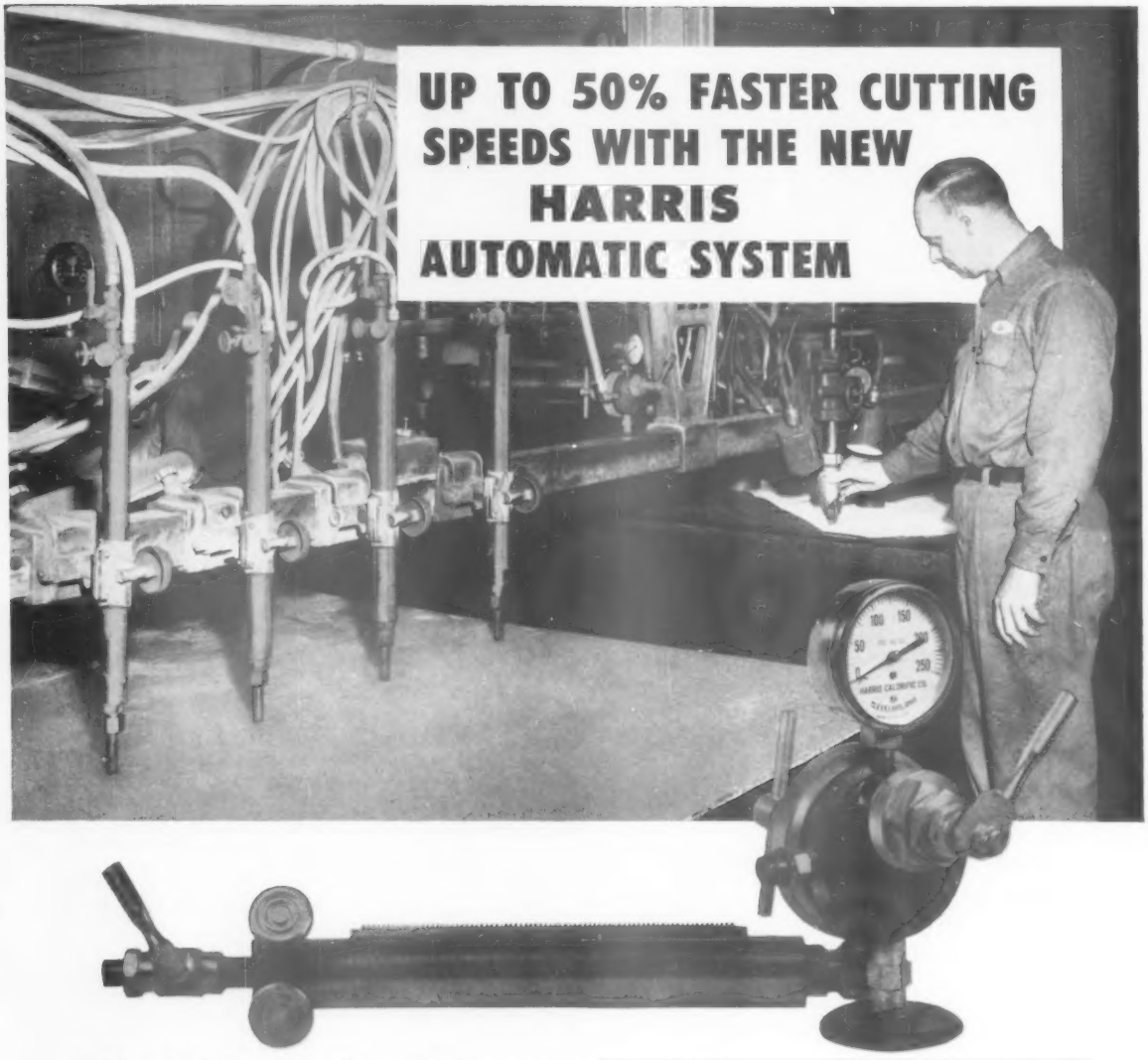
UP TO 50% FASTER CUTTING SPEEDS WITH THE NEW HARRIS AUTOMATIC SYSTEM



It takes just the flick of a wrist. You can now control pre-heat oxygen pressures to as many as eight machine cutting torches simultaneously! Working from your regular operating position, and using the new Harris system, you get unbelievably smooth, fast cutting results!

You get faster starting, piercing and cutting than ever before with the Harris unit. Independent control of the starting flame enables you to vary one without affecting the other.

Write us for further details on this remarkable Harris unit, or call your nearest distributor.

- ✓ Up to 50% faster cutting speeds over older methods.
- ✓ 80% reduction in consumption of pre-heat oxygen. Overall oxygen consumed lowered. 20%.
- ✓ Slag removal reduced to a minimum.

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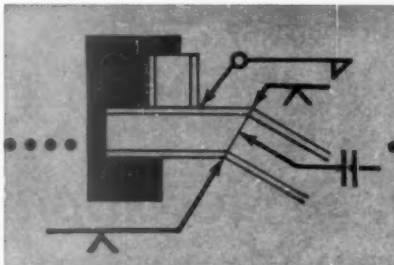

the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Precautions make arc welding safer

Question:

We have just hired the first arc weldor ever to work in our plant. We have heard that the light rays of the welding arc can cause injuries to the eyes that are more serious than just eyestrain. Is this true? If so, could you give us a few tips on the prevention of eye injuries?

Answer:

Eye injuries from welding operations result from brilliance of radiation from three sources: *(1)* invisible ultra-violet radiation, *(2)* visible light rays and *(3)* invisible infra-red radiation.

Protective measures can be given by an adequate colored lens. Selection of a color hue should be determined by an expert in order to obtain the clearest definition of vision with the least amount of glare. The dominant hue should be yellowish-green.

However, the depth of tint may best be determined by the weldor himself. This is true because individual differences in visual acuity will permit one man to see clearly through a glass which is too dark for another.

Pinholes and Bubbles

Lenses should be carefully examined for defects which might cause discomfort. Pinholes and bubbles often permit the passage of high-intensity light; such defects cause the weldor's eye to stray unintentionally toward the light source and result in eventual discomfort.

Regardless of the lens tint used for arc welding, it should be protected by a cover glass. The glass should be placed on the side of the protective lens exposed to the arc so that the globules of molten metal or other molten particles of weld spatter will adhere to the cover glass rather than the expensive lens plates of the welding helmet.

In addition to weldor protection, it must be remembered that there are other workers about the plant who are indirectly or temporarily exposed to harmful radiant energy. These men can be protected by surrounding the welding operation with screens or booths.

Opinions differ as to how far away from the welding machine a person must be before he is immune to the effects of arc radiation. The immunity distance varies, depending, among other things, on whether the welding operation is performed indoors or out.

Outdoors, it is believed that a person 30 ft. away from the arc will not experience any eye trouble. Indoors, it is recommended that persons working within a radius of 75 to 100 ft of the welding operation should have their eyes protected with lightly tinted goggles.

* * *

Question:

I am a trained weldor currently working for my army battalion. In a civilian training school. I was told not to arc weld in the rain or if my feet are wet. I was also told that if the electrode holder gets wet, it should be allowed to dry before using it again. Both of these situations have now arisen, and I would like your opinions. What kind of precautions should be taken if arc welding in the rain (or with wet feet) is permissible?

Answer:

There are many conditions which may exist when welding in the rain, and it is entirely possible that this type of welding can be done without any danger. However, no job should be so urgent as to necessitate welding in the rain, particularly while standing in water.

With a d-c welder there is not too much likelihood of danger. An open-circuit voltage of 75 or 80 volts can give weldors a jolt, and it might be a terrific one if they are rounded out as completely as they would be if their feet are wet.

Chance of Leak

With a-c welding there is the chance of a leak from primary to secondary side of the transformer. In such a case, a 220 or 440-volt shock is entirely possible and it is certainly something to be avoided.

Welding in the rain, although not recommended, might never actually result in an accident. However, the weldor is always taking a chance. It should be stressed that welding under conditions where the weldor must stand in water is definitely out of the question.

As for the electrode holder getting wet, that presents no particular problem. Many weldors make an effort to wet their holders to keep them cool. It is not too unusual to see a weldor dip an electrode holder in a bucket of water between passes.

Welding Engineer *The leader in developing*

MORE PERSONS ARE READING MORE OF

More people are reading and reacting to editorial and advertising appearing in Welding Engineer.

In 1951 . . . They spent 2 hours, 8 minutes

In 1954 . . .

A readership survey* just completed indicates that since the new, younger management has been at the helm, *Welding Engineer* is read more thoroughly than ever before. Reason: the "new look," which means more feature articles, more pictures . . . all in all, a magazine that is easier, more timely and more interesting to read.

**Results of this survey shown on request. Write: The Publisher, Welding Engineer, 12 E. Grand Ave., Chicago 11, Ill.*

high-quality sales response

SPENDING MORE TIME

Welding Engineer

They spent 1 hour, 53 minutes

In 1956 . . . They spend 2 hrs., 37 minutes

The readership poll also shows that 90% of *Welding Engineer* subscribers read the magazine *regularly*, and that the feature articles and departments aid them in their work. They also read the advertisements . . . survey results indicate that 87½% of the readers find the information contained in the ads is of value in their work.

BRAZE—HEAT—CUT—WELD

You're all set for the tough jobs

...WITH THIS #545 DOCKSON OUTFIT

#545 OUTFIT, right, is fast and versatile. Cuts up to 5" thick steel. Welding torch is ideal for light plate or heavy castings. Rigid one-piece silver soldered construction and long-life, special rubber, mixer sealing rings.

#600 OUTFIT, below, can weld up to 3/16" thickness and cut up to 1/2" thickness. A compact, lightweight Outfit suitable for all ordinary welding jobs in smaller shops.

Dockson Outfits are standard catalog items and replacement parts are available quickly when needed.

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Built for Better Service

Dockson CORPORATION

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DETROIT 8, MICHIGAN

Connecticut plant proves . . .

Braze-welding can be an art

WELDORS shown joining opposite sides of broken beam. Only one pass is made on each beam side.

*A little over a year ago—in March, 1955, to be exact—*WELDING ENGINEER *paid a visit to American Felt Co.'s plant in Glennville, Conn. American's plant superintendent, Ed Roos, described how braze-welding worked best at the plant. This welding technique has paid off in further repairs of the firm's equipment, as evidenced by the particular application described below.*

MAKING lasting repairs of broken parts has become an art with Ed Roos, plant superintendent of American Felt Co., Glennville, Conn. Just why it's an art is best explained by citing an example which is typical of heavier maintenance work performed at the company.

Not long ago a break occurred in a press which flattened felt used in manufacturing pianos. The broken part, an overhead beam of a screw press, was about 5 ft long and 4 in. thick at the top. It tapered to 6 in. at the bottom, and was 6 in. high.

Pressure is exerted on the beam when screw pressure is applied to press out 20 by 30 in. felt sheets which are ⅝ in. thick. When a 5-ton pressure is exerted, the felt is reduced to a 3/16-in. thickness. It takes ten minutes for the press operation.

END of broken cast iron beam shows V-bevel on each side.

Excessive Pressure

The break was caused by excessive pressure applied by a belt drive. Automatic stops were improperly adjusted, creating a terrific overload on the cast iron beam.

After it was dismantled, the beam was veed on each side of the break at a 45-deg angle. It was then placed on a 4 by 10 in. I-beam that had previously been cut away under the area where welding was to be done. This stopped the I-beam from overheating and becoming distorted.

Asbestos 1½ in. thick was placed in the cut-away section of the I-beam to prevent the flame from hitting it at any time.

Next, the cast iron beam was aligned thoroughly through the bolt holes and the screw bore in the casting by a straight-edge and plumb bobs. This gave good alignment across the top.

After it was bolted into position, lugs were welded to the I-beam so the short end could expand outward without disturbing alignment. The bolts, however, were removed before welding started.

Cherry Red Heat

Preheating to a cherry redness (about 1,200 F) was done on both sides of the break. Two oxyacetylene torches using ⅛-in. orifices in the tips did the job.

After proper preheat was reached, approximately 15 minutes were allowed for cooling. This gave the heat an opportunity to travel most of the beam length. During this time, temperature dropped 300 to 400 deg.

The beam expanded 3/16 in. in length from preheat. Therefore, the precaution of *not* bolting it down solid paid off.

Heat was directed up and down both sides simultaneously until the casting was cherry red 5 in. from each side of the break. Both weldors then changed from ⅛ to 1/16-in. tips and welding with low-fuming bronze commenced.

Welding Vertically

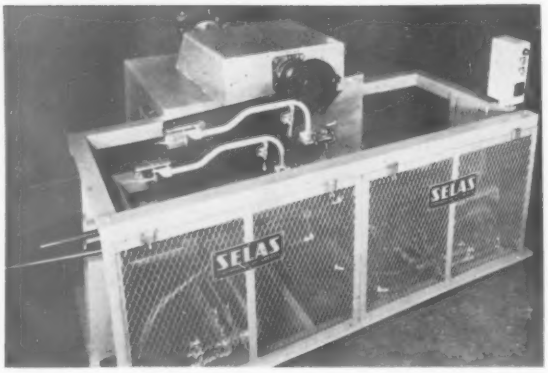
Each weldor fluxed his side thoroughly by holding the end of his rod in the flame and then dipping it into a good grade of flux used for cast iron and bronze. The two weldors started at the bottom and worked vertically, depositing a full layer of weld bead and making only one pass on each side of the beam.

Approximately 1½ hours were required to make the two beads; 20 lb of ¼-in. low-fuming bronze rods were used. When it was finished, the beam was covered with several layers of ⅛-in.-thick asbestos.

Thin asbestos was used because it could be formed more closely around the repair; in addition, it arrested cooling better than one thick sheet. The beam was then covered completely with another layer of asbestos and allowed to stand for 24 hours.

The next day it was replaced on the press without any machining. Alignment was said to be so nearly perfect that only a 0.2-in. shim was needed.

Since that time the beam reportedly has been operating perfectly and without any delays—another tribute to the reliable oxyacetylene torch and braze-welding practices properly administered.



ALUMINUM tubing is brazed to cast aluminum fittings in automatic brazing unit. Close heat control is obtained with machine.

Automatic brazing boosts economy

A MANUFACTURER of gasoline pumps for service stations is currently avoiding the expensive use of copper tubing and brass fittings by employing an automatic, gas-fired brazing process to join more economical aluminum components.

The brazing machine joins a fixture to each end of two pre-shaped tubes in one operation.

Close control of combustion, flame geometry and timing is vital in the job performed by this unit, for a temperature differentiation of only 50 F exists between flow point of brazing alloy and melting point of parent metal.

Uniform Heating

The machine produces required brazing temperature simultaneously in the thin-walled aluminum tubing, the brazing alloy and a heavy casting. Timed firing cycles heat parent metal and brazing alloy, and burners are automatically idled during indexing, loading and unloading periods.

The operator of the machine need only load and unload parts, and press a starting button.

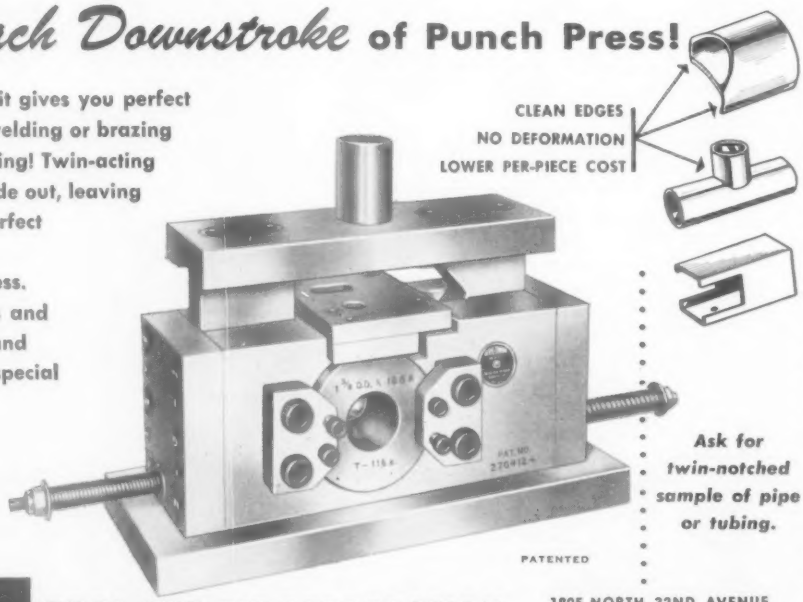
Tubes are brazed to cast fittings in a vertical position. The machine will accommodate assemblies having single fittings, two fittings situated at 90-deg angles, and two fittings at 180-deg angles from each other. A selector switch permits any of the three operations.

Through the use of 18 fixtures that can quickly be changed, the vertical indexing dial conveyor will accommodate 18 different assembly designs.

the ARC-TWIN Double Notches Pipe and Tubing with Each Downstroke of Punch Press!

SAVING both time and cost, it gives you perfect T-joints—instantly ready for welding or brazing without deformation or finishing! Twin-acting punch shears clean, from inside out, leaving two matching notches (in perfect 180° alignment) with every downstroke of the punch press. Quickly interchangeable dies and punches accommodate pipe and tubing from ½" to 2⅛" O.D.; special units, up to 3" O.D.

CLEAN EDGES
NO DEFORMATION
LOWER PER-PIECE COST



Special Arc-Twins for double notching stainless steel or monel metal and units built to your specifications can also be furnished.

PATENTED

Ask for twin-notched sample of pipe or tubing.

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If you need to spot hidden defects to keep a firm finger on quality control, we'll be glad to tell you what radiography can do for you.*

** There's probably a Picker District office near you (see local 'phone book). Or write Picker X-Ray Corporation, 25 South Broadway, White Plains, New York.*

5 to 50 KV
Small as a filing cabinet, yet it will x-ray anything up to ¼" thick aluminum. Self-contained, completely rayproof.

150 KV
Penetrates up to 1" steel and 5½" aluminum (more with screens). Stationary or mobile for "on-the-spot" x-raying.

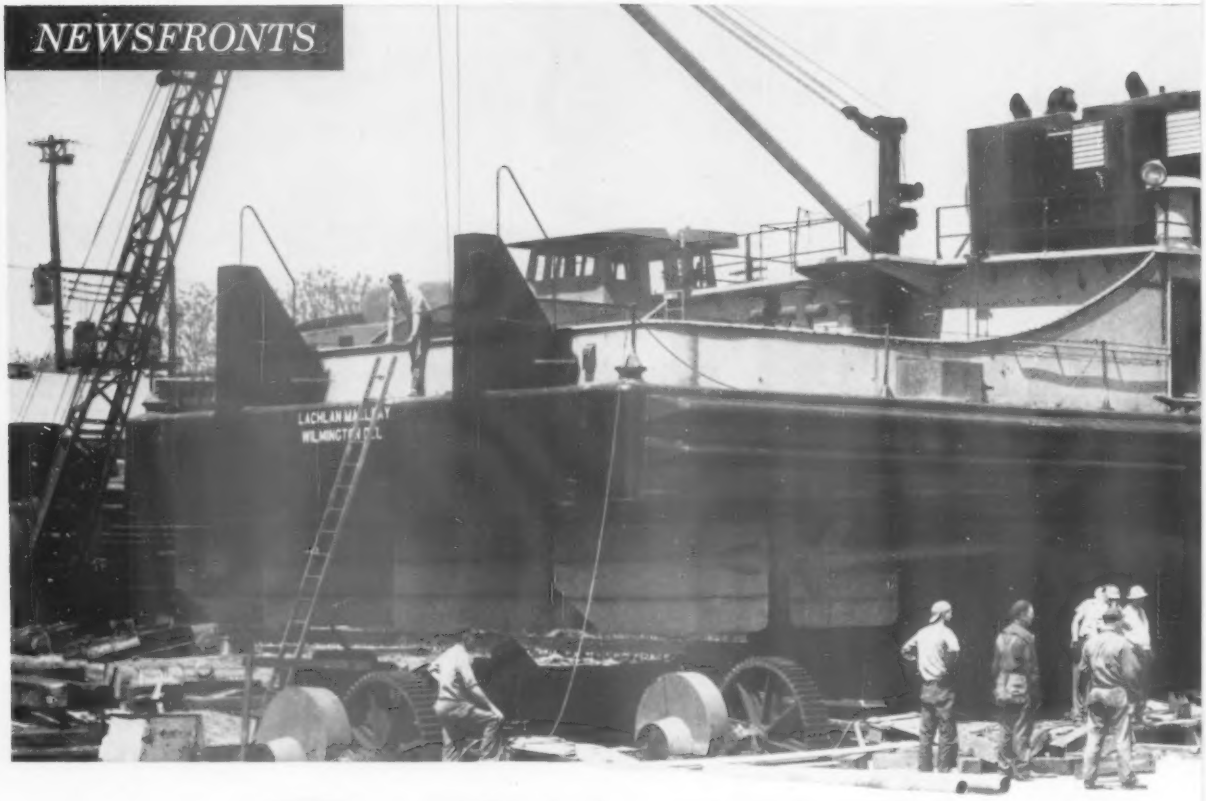
250 KV *portable*
Rugged, lightweight 250 KV tubehead with separate remote power chassis. Will enter openings as small as 15" square.

RADIOGRAPHIC CABINETS
Rayproof enclosures obviate need for lead-lined rooms. Available with or without feeder tables.

260 KV *crane or dolly*
For heavy-duty inspection (up to 3" steel). Operating down to 60 KV, will x-ray a wide range of other materials.

GAMMA *Sources, equipment, containers.*
Panoramic, circumferential, and directional projectors using cesium, iridium or cobalt isotopes.

one source for everything in Picker x-ray **radiography and fluoroscopy**



Built to foil

Largest barge pusher ever built for Missouri River service. Knowing the river's way of throwing up shifting sand bars and other obstacles, St. Louis Shipbuilding built in plenty of reserve strength... did much of the welding with SW-10 A. O. Smith electrodes

Lachlan Macleay begins to shape in St. Louis Shipbuilding's ways. Most of welding is multi-pass on heavy gauges. The barge pusher is 165 ft. long.

Four 900-hp diesel engines turn these 78-inch steel alloy propellors. A sister ship of the Lachlan Macleay is currently under construction.

a tricky river

In addition to 3600 horsepower, the Lachlan Macleay had to have shallow draft and extra strength in hull construction.

Welding, primarily, is on ½ and ⅜-inch plate. To insure watertight welds — welds with less chance of being sprung should the Lachlan Macleay hit sudden underwater obstacles — St. Louis Shipbuilding & Steel Co. is using SW-10 (E-6010) A. O. Smith electrodes.

Similarly, if you use welding in your work you, too, can insure the quality of welds . . . be positive you're getting maximum strength and dependability at lowest overall cost by specifying A. O. Smith electrodes. As thousands of users can tell you, A. O. Smith quality doesn't cost, it pays — in terms of less welding time, money and trouble. Why not get the complete story from your "man from A. O. Smith" today?

The man from A. O. Smith

. . . Hal Costello is the A. O. Smith welding consultant who worked with St. Louis Shipbuilding. More than a salesman, he's a welding specialist, ready and eager to help with any welding problem.

PRODUCED BY WELDERS — FOR WELDERS — Because welding is our full-time business, we offer you America's finest welder-proved electrodes, machines and accessories.

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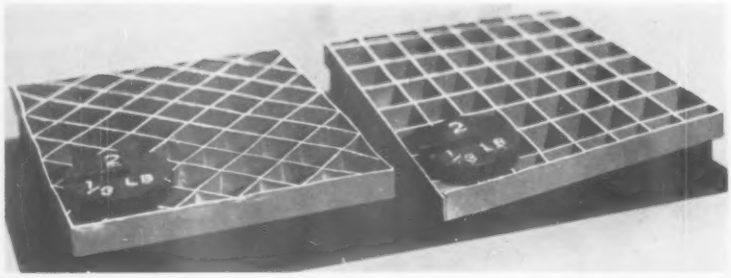


SCALE models of type bed for printing press indicate marked advantage of 45-deg bracing. Three corners of each model are supported.

In the July issue of *Welding Engineer*, Mr. Blodgett analyzed the advantages of redesigns to permit the use of steel weldments in place of castings. Strength and economy were the principal advantages, and they appear again in this article as the results to be gained when you . . .

Weld proper braces to resist twisting

By Omer Blodgett, *Design Engineer*
The Lincoln Electric Co.
Cleveland, Ohio

WHEN DESIGNING machinery components to resist twisting, turn to properly braced steel weldments!

The authority for this statement can be found, first, in a fundamental design principle and, secondly, in a string of highly conclusive cost figures.

The principle, which can be applied to machinery frames, bases, levers, fixtures, brackets and other parts, points up the fact that tensile stresses resulting from twisting lie on 45-deg planes and that braces should meet these stress planes to provide maximum efficiency.

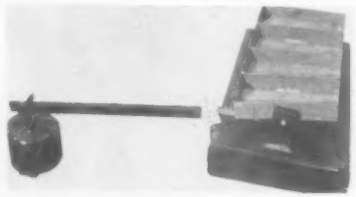
Cost figures, to be presented later in the article, are real clinchers once you have accepted the diagonal bracing principle.

Few would bother to dispute the fact that flat steel plate offers little resistance to twisting or torque loads. And the additional strength given by a group of such plates working together is more costly than significant.

Hard to Bend

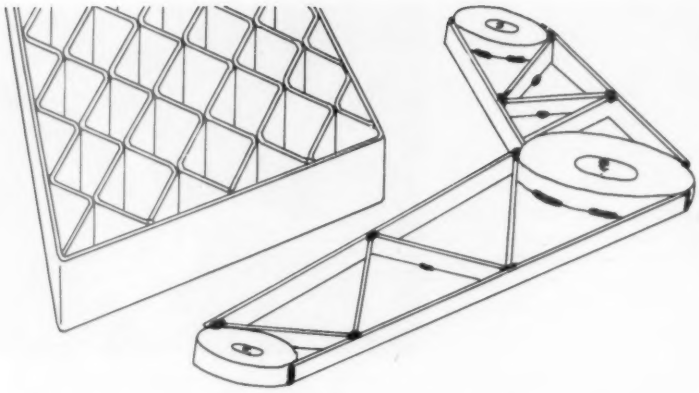
This same steel plate, however, when set on edge, is highly resistant to bending loads from above or below which must work against the full plate width.

This, in a nutshell, is the basis for the diagonal bracing theory—and



CONVENTIONAL 90-deg cross bracing is put to test in model form and twists 9 deg. Flat sheet of similar thickness would twist 10 deg.

DIAGONAL braces in redesigned model lie on plane of twisting stresses and allow only ¼-deg twist. Less bracing material is used in this model.



TWO of the many ways in which the principle of 45-deg bracing to achieve greater twist resistance may be applied on machinery components.

manual arc welding leaves any design engineer the freedom he needs to employ it on all parts subjected to heavy twisting loads.

A conventional machine base with plain cross ribs offers least resistance to twisting loads. This 90-deg ribbing simply moves in the same direction as the steel plate beneath it.

Steel braces placed on a 45-deg angle from side to side of this same machine base would be highly efficient twist resisters, as illustrations in this article indicate.

Strength Measurements

A model base with 90-deg ribs, when placed under a nominal corner load, twisted 9 deg. Compare this to the results obtained in a similar test on a plain flat sheet of similar thickness: the sheet twisted 10 deg.

The 90-deg braces, then, gave the base a strength equivalent to only 1 deg of twisting load!

A model base with 45-deg braces (also pictured) reacted to the same load by twisting only ¼ deg. This brace, which uses about 6% less bracing material than that employed in the conventionally-braced base, is roughly 34 times more resistant to twisting.

Cost comparisons for these base types are startling. The cross-ribbed brace, if it were made of 1-in. plate, would weigh perhaps 900 lb. Total cost of fabrication would be approximately $120.

The base with 45-deg braces could be fabricated with ⅜-in. plate at a cost of about $55. It would weigh only 350 lb.

Approximate Costs

Factors which make up total approximate cost figures for the conventionally-braced base include:

900 lb of steel . . . $45
Flame-cutting . . . $8
Assembling . . . $49
Welding (552 in.) . . . $18

Designing the base for 45-deg braces would drastically cut these figures largely because of reduced plate thickness. With less thickness there is less weight; there is no need for flame-cutting (plates could be sheared and braked); assembling costs would be cut in half due to easier handling, and the area to be welded is also cut more than 50%.

Simple diagonal braces, or "criss-crosses," may not have the strength *appearance* of 90-deg braces, but their rated performance in rigidity and strength—plus their economy—recommend them whenever and wherever new designs or redesigns are contemplated.

AIRCO

WELDING and BRAZING *Hints*

PROBLEM:

To weld and braze aluminum

SOLUTION:

Airco #718 Aluminum Brazing Rod. This free flowing rod (at 1050°F.) maintains low flow temperature and assures good penetration of aluminum brazing alloy at the joint. Recommended for brazing aluminum assemblies having base metals of 52S, 61S, 63S and other compositions.

Airco #25 Drawn Aluminum Rod. Composed of commercially pure aluminum composition known as 2S. Recommended for welding base metals of 2S and 3S analysis.

Airco #26 Drawn Silicon-Aluminum Rod. This rod is generally recommended for repair jobs when there is doubt as to the analysis of the aluminum parts to be welded.

Napolitan Sheet Aluminum Welding Flux. Formula 40 is unsurpassed for welding aluminum and its alloys in either sheet or cast form. *Formula 42* generally is satisfactory to use for a variety of work where reduction of welding costs is a factor. It is less expensive than formula 40.

Airco Aluminum Brazing Fluxes. Formula 44 is designed, primarily, for furnace brazing of brazable alloys. *Formula 60* is primarily for torch brazing of aluminum.

Send for this free catalog!
You'll find here the finest rods and fluxes for joining both ferrous and non-ferrous metals. Write Airco at address below.
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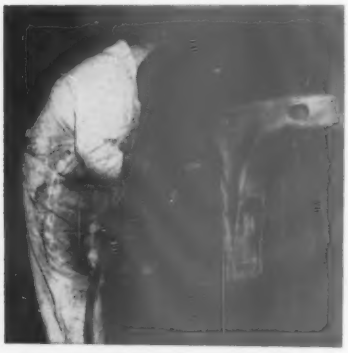
• **FAST AND ECONOMICAL** operation makes the Arcair torch a widely used tool in many types of industrial maintenance and repair applications. Packing houses, paper mills and breweries use the Arcair torch for economical cutting of stainless steel and brass plate when reworking vats and tanks . . . mines, quarries and contractors use it for removing hard surfacing, repointing manganese teeth and stainless steel welds on dipper plate lips, etc. . . . power plants, water works, lumber mills and users of heavy machinery find the Arcair torch a life saver for repairing broken castings, reworking machine sections and preparing worn gears for rebuilding. Arcair reduces downtime, keeps machinery on the job!

USING ONLY an electric arc and compressed air the Arcair torch is simple to operate, and has countless other applications throughout all industries. The fastest, best and cheapest way is the Arcair way! Write for complete details today!



Railroad car maintenance on stainless steel, Illinois shop.

Arcair Company
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Write
for your FREE copy of Arcair's new "CASE HISTORY BOOK". See positive proof of Arcair money-saving performance in countless industries!

SOLD BY WELDING SUPPLY DEALERS

LARGE seam welding wheel is precision machined at Mallory plant. Wheels such as this are used extensively in automotive welding.

40 service years for P. R. Mallory

INCORPORATED in 1916 as a manufacturer of tungsten filament wire, P. R. Mallory & Co., Inc., is now celebrating 40 years of expansion into many new fields.

All activities have been devoted to the development of technology and to products founded on the basic sciences of electronics, metallurgy and electrochemistry.

A major area of development for the Indianapolis, Ind., firm has been in the field of resistance welding. This economical mass production process is an important tool in many industries fabricating metal products.

Durable Alloy

Mallory entered the resistance welding field with a long-wearing powdered alloy of copper and tungsten first used in the automotive field in 1926. The alloy notably increased the life of dies used to weld wire wheels.

In the 30 years following this introduction, the firm has created a wide range of alloys and powder metal compositions for welding applications. Methods also have been evolved for producing bent electrodes by cold-forming techniques that provide both strength and wearing qualities.

Fluted holes — giving increased heat-dissipating area for water flowing through electrodes—and bent-in-place cooling tubes to bring water to the working face of odd-shaped electrodes, are further Mallory innovations.

Over the years, the firm has developed a full line of electrodes and holders. These electrodes are produced in varied shapes that permit the user to assemble from stock almost any desired welding configuration.

Seam welding wheels, welding dies, fixtures, forgings and castings are some of the resistance welding products which have been added to the firm's line.

The proper selection and use of this equipment to suit the needs of individual manufacturing requirements is insured by Mallory's technical service representatives, who perform one of the most important phases of the welding department's work.

MACHINE designed by Mallory engineers cold-forms odd-shaped electrodes to increase wear resistance and life.

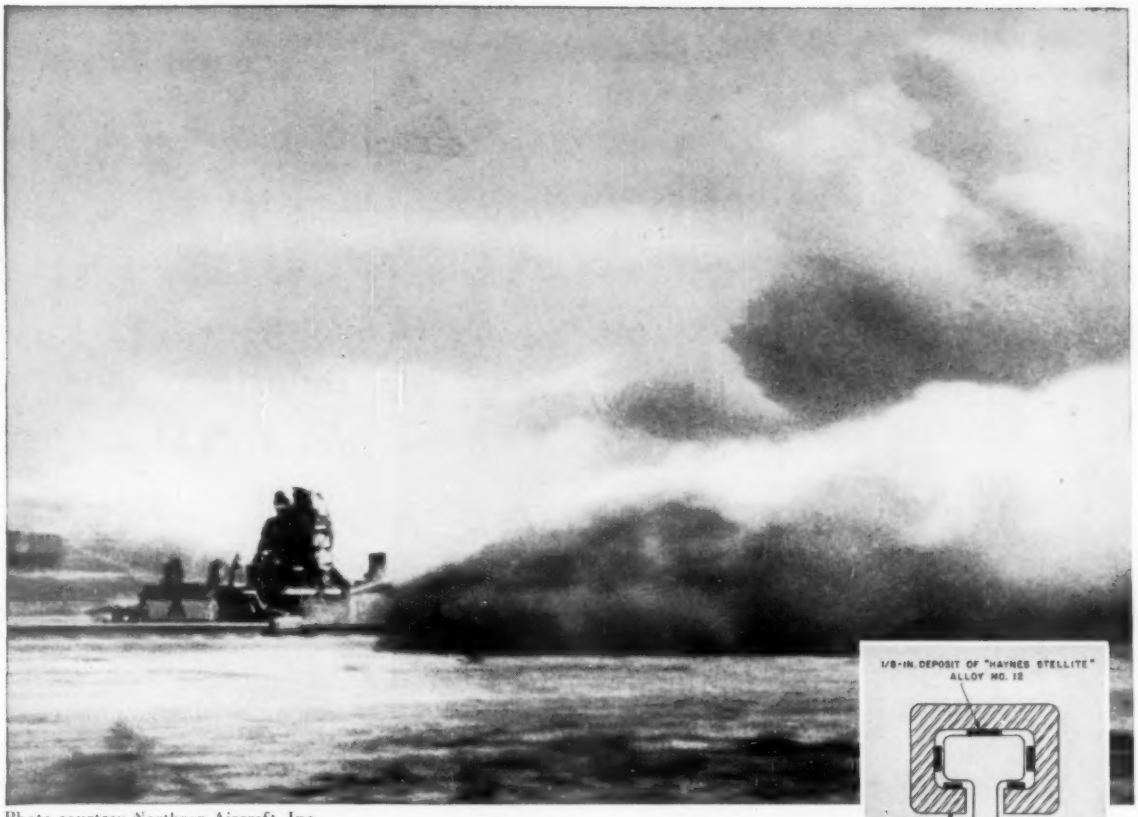

Photo courtesy Northrop Aircraft, Inc.

Rocket Sled Rides at Supersonic Speeds on Hard-Faced Slippers

Four hard-faced slippers bear the entire weight of this rocket-propelled sled as it hurtles down a special railway at more than 900 miles per hour. Hard-facing protects the slippers from abrasion and the tremendous frictional heat generated during each run, and enables them to make 12 trips. Before hard-facing was adopted, the slippers wore rapidly and often had to be replaced after every trip.

As the sketch (above) shows, each slipper is hard-faced at five locations with HAYNES STELLITE alloy No. 12 rod. The cobalt-base alloy is deposited by the metallic-arc method and then finished by machining.

The successful use of HAYNES STELLITE rod on the rocket sled slippers emphasizes several outstanding characteristics of this cobalt-base material. It has exceptional resistance to metal-to-metal wear and frictional heat. It retains its hardness even when exposed to temperatures in the red heat range. In addition, it will withstand the effects of corrosion, erosion, and oxidation, and it has a low coefficient of friction. This combination of properties makes it extremely valuable for protecting such industrial parts as valves, valve seats, bushings, pump shaft sleeves, mandrels, extrusion screws, punches, and dies.

For full information on the complete line of 19 HAYNES hard-facing alloys, designed for every condition of wear, write for the booklet, "HAYNES Alloys Hard-Facing Manual."

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

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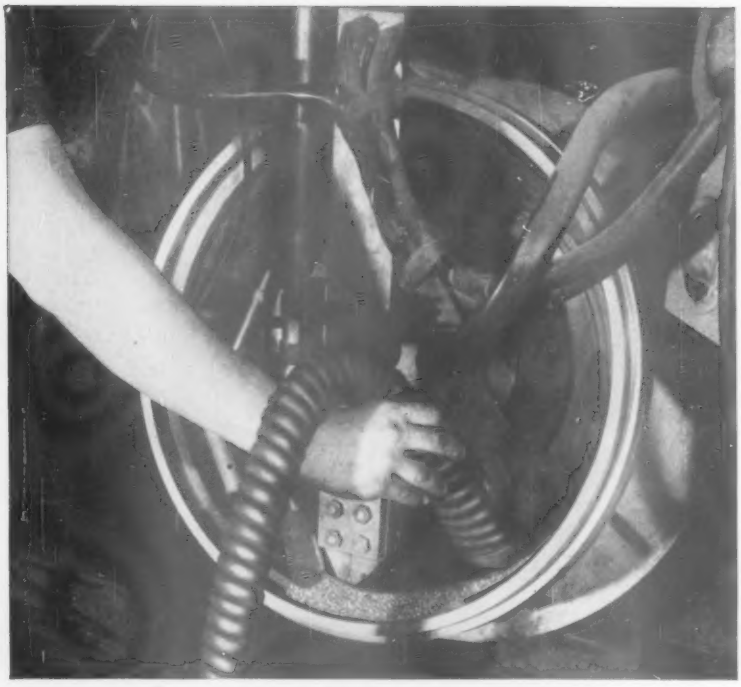


INVINCIBLE

Welding Flux Recovery Units Quickly Pay for Themselves!

The American Welding and Manufacturing Company, Warren, Ohio, has used Invincible units for several years along with their submerged arc welders. They report that:

1. The Invincibles recover *all* the unfused flux for re-use.
2. The quality of recovered flux is high for Invincibles return only slag-free, usable material to the hopper of the welder.
3. The operator removes unfused flux from area of weld so he can concentrate entirely on his work.

Model 490 designed especially for use with portable welding equipment.

Two machines used by this manufacturer salvage about 100 lbs. of material daily. So, within a few months the value of the flux recovered was equal to the price of the Invincibles. Since then, they have made important savings while giving trouble-free service.

WRITE FOR FOLDER on all types of Flux Recovery Systems.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

OXYACETYLENE torch and plaque salutes pioneer of hardfacing industry.

Torch helps industry pioneer recall "old days"

AN OXYACETYLENE torch stands as a tribute to W. E. Adams, 59, a leader in the field of hardfacing agricultural tools. Mr. Adams pioneered an agricultural hardfacing industry in the years immediately before and during the depression.

Recently, two of his friends had the first oxyacetylene torch he used, an "Imperial" model, cleaned, plated and placed in a case. Mr. Adams, who suffered a heart attack in March, received the torch in his home in Guymon, Okla.

Adams

He began operating a blacksmith business at Harper, Kan., when he was 17 years old, and established a similar business in Wakita, Okla., in 1923. At that time he purchased welding equipment and started a welding and blacksmith shop.

In 1927 he became acquainted with a cast hardfacing rod, and experimented with application of this material on one surface of a thin edge, such as a plowshare.

Mr. Adams felt the steel would wear faster than the hardfacing material, making a self-sharpening edge. He hoped to prove that such shares would stay sharp throughout an entire season and would last longer.

In 1928, he started a full-time promotion specializing in the hardfacing business. Throughout the years he has continuously promoted development of new techniques and more applications.

ARCOS announces . . .

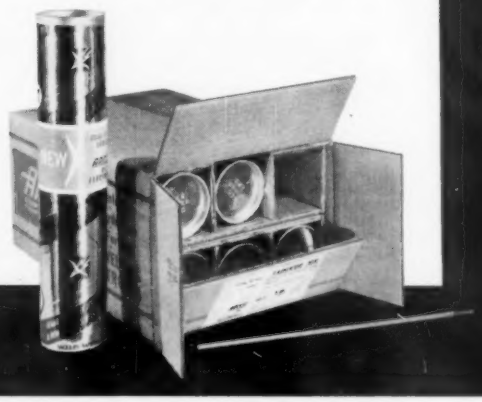
new easy-to-use DC electrodes

THE AEROCOR SERIES

Especially developed for DC reverse polarity welding of stainless sheet metal. Available in the following types: 308, 309, 310, 316, 347, 349, 410; sizes 1/16" to 1/8" dia.

THE FABRICOR SERIES

Especially developed for DC reverse polarity welding of heavy stainless. Available in the following types: 308, 309, 310, 316, 347; sizes 3/32" to 1/4".



Good news for every user of stainless electrodes

AEROCOR and FABRICOR identify America's newest DC welding electrodes.

To users they offer an opportunity for faster, easier welding. They've been especially designed for quality welds with the benefits and properties you want most.

For example, on every job, AEROCOR and FABRICOR Electrodes offer you these advantages:

- **Excellent arc action**
- **"Drag-type" welding technique**
- **Little or no spatter**
- **Superior washing action—good contours, sound penetration**
- **Smooth, even-rippled weld beads**
- **Slag that chips off quick and easy**

AEROCOR and FABRICOR are manufactured to the same high standards as all ARCOS Stainless Electrodes. And they're packaged in the famous Arcos ELECTROPAK — the easy-to-open-and-reseal container that protects against moisture pick-up and chipped coatings. Both series are identified by a bright orange colored label. Available through your Arcos representative or distributor.

FREE PERFORMANCE TEST

See the results in your own plant. Compare the performance of these new ARCOS Electrodes to what you're now using. Just drop us a line on your company letterhead and we'll arrange a demonstration. No obligation, of course.

More than ever it pays to . . . **WELD WITH** ARCOS

ARCOS CORPORATION • *1500 South 50th Street* • *Philadelphia 43, Pa.*

COMPLETE FOREHEAD PROTECTION

with Sellstrom's No. 372 DEPENDON Shield!

A special formed fibre cap protects the forehead against dangerous flying particles! That's an *extra* feature you get—in addition to the regular fine features of the No. 372 DEPENDON Shield.

These dependable shields are light weight, yet strong, and positive size-adjustment gives utmost comfort through individual choice of firmness. The open top has the exclusive Sellstrom rotary swivel which permits the greatest ventilation control. The headband has a fibre head strap. Easy-to-replace bound windows, available in clear or green, have three glove fasteners.

No. 372 has met the demand for a safe and comfortable shield!

So you can see the features of the No. 372 for yourself, SEND FOR SAMPLE for 30 day trial. Then you will appreciate the merits of this unusual shield. Write today.

Our new general catalog (No. 33) is now ready. Want a copy? Write today.

DISTRIBUTORS IN ALL IMPORTANT CITIES

sellstrom
MANUFACTURING COMPANY

Eye and Face Safeguards Designed for Utmost Comfort

226 Hicks Road Palatine, Ill.

MAKING a high-speed butt weld in boxcar side. In this operation, car side posts serve to back up submerged-arc welding.

—Courtesy Linde Air Products Co.

Welded steel sides give boxcars that "modern look"

WITH the aid of two submerged-arc welding machines, Seaboard Airline Railroad Co. recently performed its own plastic surgery on 200 boxcars.

The cars were stripped of their worn, wooden sides and modernized with submerged-arc welded all-steel side walls. The welding machines, together with a turnover jig to flip the cars on their side, are claimed to be responsible for considerable savings in cost and time. The jig served to facilitate handling.

After the wooden sides were removed, ⅛-in.-thick steel side plating was tack welded to the frame. Butt seams were placed over car side posts which later served to back up welding.

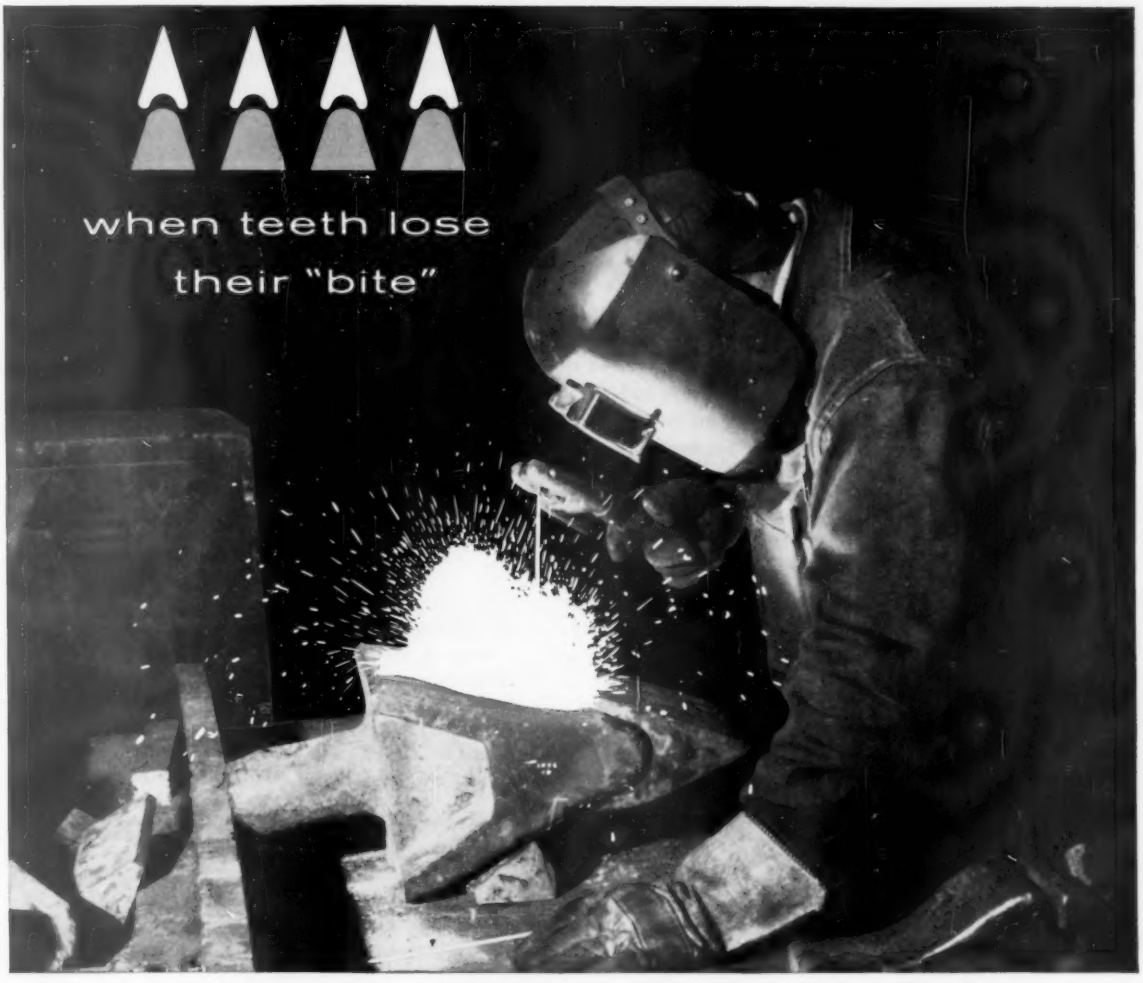
Boxcars then were moved onto the turnover jig where each car was hoisted off its trucks, tipped, and rested on its side.

All joints were sand blasted just before the welding operations started to assure clean sheet edges. The two welding machines made a series of eight 8¼-ft-long butt welds, and two 14½-ft-long fillet welds on each car side. Finished welds needed no special treatment.

When one side was completed, the car was hoisted, spun 180 deg, and set down for welding of the second side.

Seven weldors and two helpers completed an average of four rebuilt boxcars a day. They reportedly completed fillet welds three times faster with the submerged-arc process than with fabricating methods formerly used. Weld quality was also said to be improved.

HOISTED free of its trucks, boxcar is spun 180 deg to allow submerged-arc welding on each side.



It's a **15-MINUTE REBUILDING JOB**
with Amsco® Cast-to-Shape Repointers

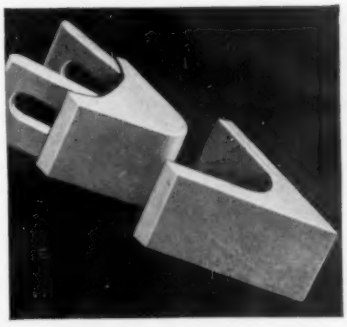
Easy to weld on . . . add strength and service life to entire tooth

Where dipper-tooth wear is moderate, and where digging conditions are not too severe, Amsco Cast-to-Shape Repointers provide a cost-saving answer to tooth replacement.

An average-size tooth can be completely rebuilt in about 15 minutes. The repointer overlaps the tooth top and bottom and is easily welded in place, using only a few electrodes.

Cast of Amsco Manganese Steel, with "ears" that protect the flat sides of the tooth, these repointers add strength and service life to the entire tooth. Available as individual repointer units, or in bar lengths.

For heavy digging, use Amsco "Wear-Sharp" Repointers or Repointer Bars. Order Amsco Repointers from your nearby Amsco Distributor.



AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DEL., OAKLAND, CAL., ST. LOUIS; JOLIETTE, QUEBEC

Distributed in Canada by Canadian Liquid Air Co., Ltd.

HERB Quartz helped to develop the "Weld-O-Tron" welder, one of the first rectifier welders that ranged from 5 to 100 amp.

Herbert Quartz, said to be the oldest living oxyacetylene weldor in the U. S., continues to recall his early days in the welding industry in this and a future issue now that he has been . . .

50 years a weldor

THE BIRTH of the welding industry was a period of trial and error. Various ways and means were tried; the successful methods were upheld and the failures discarded, but not forgotten.

There were also the usual number of crackpots. One of them wanted to house an engine in a glass enclosure filled with ether and let the heat of the sun make a gas from the ether to run the engine. He hoped to go across the Sahara Desert in this manner.

Herbert Quartz was with Best Mfg. Co. when it opened the country's first welding shop—the Pittsburgh Welding Co.—in 1906. In the latter part of that year, Best received the contract for installation of piping at Illinois Steel Co.'s power house in Gary, Ind. This job marked the first use of autogenous (oxyacetylene) welding of piping in a power plant installation.

Header Supports

The question of proper supports was raised for a large, high-pressure pipe header made of 5/8-in.-thick pipe with high-pressure flanges and a 30-in. OD. It was about 400 ft long with 28 4-in. outlets distributed equally over its entire length.

The usual practice up to that time required a steel forged tee for each outlet, with necessary flanges on the pipe to connect each. However, this method entailed too much weight to be safely supported from roof trusses.

It was decided to weld a 4-in. pipe nozzle to a piece of 30-in. pipe for test purposes. The results of the tests made on this section were so successful that all 28 nozzles were welded to the header. Net result was a reduction in weight amounting to 60% which made support of the header from the roof an easy matter.

Profitable Demonstration

In December, 1908, George Johnston, chief inspector of Buckeye Steel Casting Co., Columbus, Ohio, asked for a demonstration of Best's welding equipment. Herb went to the Buckeye plant for one month to weld integral box-type truck frames, bolsters and couplers for various railroads.

However, he soon discovered that his little oxyacetylene plant was too small for heavy steel castings. So Mr. Johnston ordered a 100-lb acetylene generator complete with a two-stage compressor oxygen plant.

Herb had returned to Pittsburgh before the new equipment arrived at the Buckeye plant. When it came in, however, A. H. Thomas, superintendent, offered him the job of welding foreman at the Buckeye plant.

Herb gladly accepted and went back to Columbus to begin the second major phase of his welding career. One of his first jobs was to install the new acetylene generator and other equipment. A very surprised installation man arrived a few days later to find the job already done.

FRONT exterior of new building that houses York Engineering Co. and parent organization, Chicago Welding Sales Co.

York moves to new quarters

YORK Engineering Co., Chicago, and its parent company, Chicago Welding Sales Co., have recently moved to new quarters at 2711 S. Kedzie Ave. The firms were formerly located at 3349 Ogden Ave.

York manufactures fluxes and anti-spatter compounds; Chicago Welding Sales is a welding supply distributor. The latter is celebrating its silver anniversary this year. It was founded in 1931 by S. H. Shaykin, who still is president.

The new $70,000 building is a modern, one-story, concrete-block and brick structure that offers 8,000 sq ft of floor space—twice the area of the old quarters.

Ample parking space is available in front and to the rear. The area in the rear provides room for further expansion.

The new facility includes a special test room with an exhaust fan in the ceiling. A hydraulic lift at the rear enables easy loading and unloading of trucks. Cylinder storage is outdoors, but fenced in.

ATOP hydraulic lift is I. R. Silver, vice president and general manager. At right is outdoor cylinder storage area.

P&H Welding Positioners give you

EXTRA CAPACITY

for BIGGER PRODUCTION SAVINGS

Exclusive P&H design features permit handling greater positioning loads for every dollar you invest

Positioned welding is *downhand* welding that permits your weldors to use larger, hotter rods for higher deposition rates. This extra welding speed and the savings in handling of weldments cut welding costs as much as 50%.

When economies like this are possible, it pays to get P&H positioners. Size for size, they can handle the widest range of weldments — give you the greatest capacity per dollar invested. The chart below compares the load capacities of positioners in the 3000-lb. class and proves the extra value of P&H.

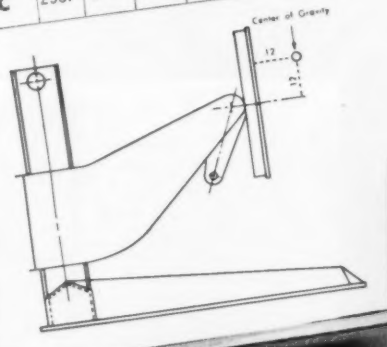
This extra-capacity advantage is found in all sizes of P&H positioners. A free load-capacity table is available to help you select the model best suited to your needs. Just send in the coupon.

HARNISCHFEGER
MILWAUKEE 46, WISCONSIN

3000-LB. MODELS
LOAD CAPACITY COMPARISON CHART

Capacity Shown Below at 12" off center of Rotation and Distances of Center of Gravity of Load from Table.

Positioner	12"	18"	24"	30"	36"	42"	48"	54"	60"
P&H	**3000**	**2510**	**2160**	**1900**	**1690**	**1520**	**1390**	**1270**	**1180**
A	3000	2000	1500	1200	1000	—	—	—	—
B	3000	2250	1800	1500	—	—	—	—	—
C	2987	2187	1725	1424	1212	1056	935	839	760



I'M SMOOTHARC SCOTTY...and I'm always looking for ways to save money. That's why I like the extra capacity of P&H positioners. Our FREE load-capacity table will show you why.

SEND COUPON TODAY FOR FREE INFORMATION

P&H HARNISCHFEGER CORPORATION
Welding Division
4513 West National Avenue, Milwaukee 46, Wisconsin

Attention: W. R. Stephens, Sales Manager

Please send me your free load-capacity table covering the P&H Positioner line.

Name _____ Title _____

Company _____

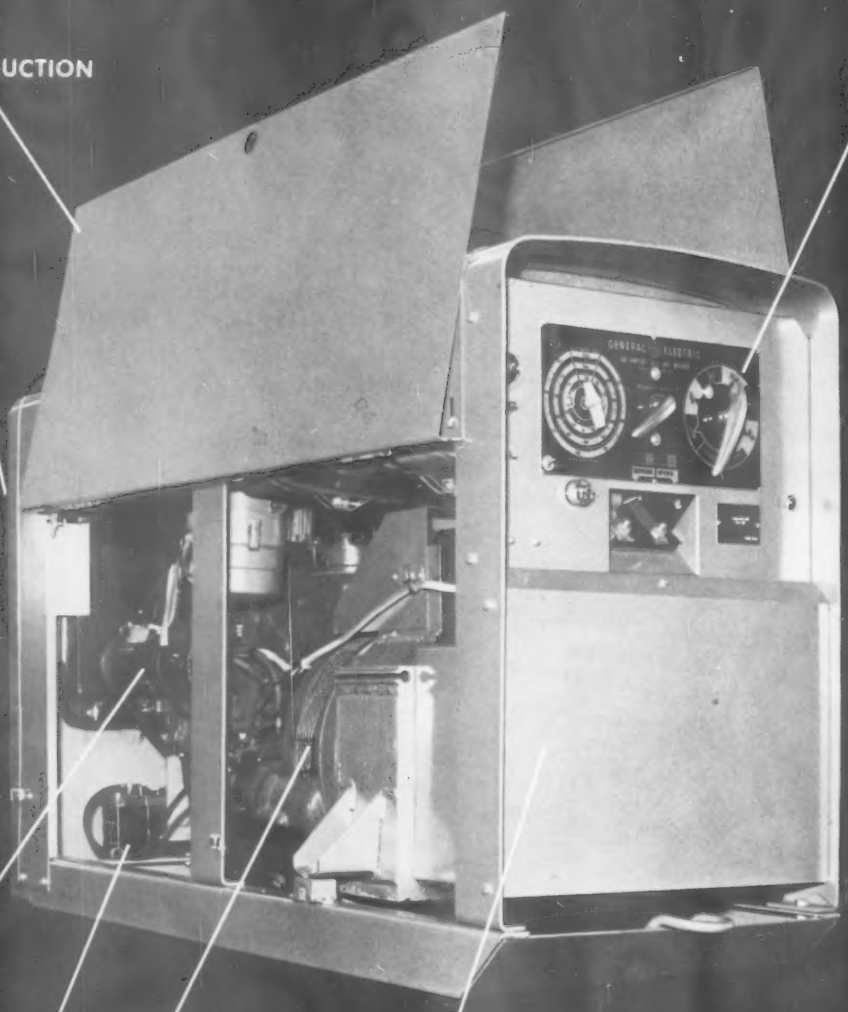
Address _____

City _____ Zone _____ State _____

3090

the P&H *Line*

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY LTD., 455 King Street West • Toronto, Ontario, Canada



Prove it to yourself— Make this actual feature-by-feature comparison of General Electric engine-driven welders with two other lines of engine-driven welders. You will see that only the new G-E welders have so many advanced design features for better welding at lower cost.

EASILY PRESET Electrode Selector, Current Dial—Dual Controls make current setting easier and more accurate.

GENERAL ELECTRIC	✓	
MANUFACTURER A		
MANUFACTURER B		

NOW—AVAILABLE IN 200-, 300-, 400-AMP MODELS

How General Electric's NEW Line of Engine-driven Welders Help You Save with Faster Welding

Advanced design assures less "downtime," minimum maintenance — for faster, lower-cost welding

Nothing stretches out welding time more than unreliable or obsolete equipment. Such equipment increases your maintenance costs and results in nonproductive "downtime."

To reduce welding delays, General Electric's new line of engine-driven welders has been designed and field-tested for maximum durability and minimum maintenance—without sacrifice in performance. These new 200-, 300-, and 400-amp welders save for you with the following advantages:

SAVE YOU TIME—Sturdy construction, the dependable Hercules engine, new-design generator, and simplified control all combine to give you steady output, longer operating time between overhauls, and reduced maintenance. This means more production per machine . . . per man-hour.

SAVE YOU MONEY—General Electric engine-driven welders begin saving you money the first day on the job. For example, the deep-sump crankcase provides complete lubrication to all moving engine parts—up to a 15-degree tilt in any direction. This helps to reduce costly breakdowns. And the over-all advanced design assures you of more and better welds at less cost, with a reduction in costly downtime for maintenance and repair. Additional General Electric advantages are described below.

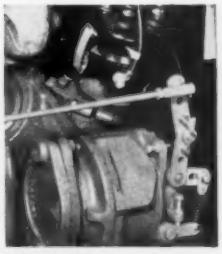
For more information about how General Electric engine-driven welders can help you, contact your nearby General Electric Welding Distributor. He is listed in the yellow pages of your telephone book. Write for descriptive bulletin to Section 714-5A, General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

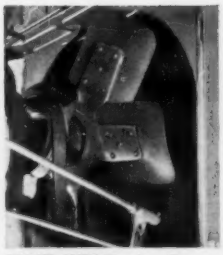
GENERAL ELECTRIC

CONSTANT-PRESSURE Brush Springs—Right pressure maintained for life of generator brushes without adjustment.

PRELUBRICATED Generator Bearings—Ball bearings prelubricated with sufficient grease for years of service.



DEPENDABLE Geared Governor—Gear-driven governor maintains close speed regulation for best welding.



PUSHER-TYPE Engine Fan—Large diameter pusher-type fan circulates ample cooling air for engine and generator.

CONTROLLED CURRENT Peaks—Current peaks are controlled. Arc can be crowded with no "stumbling" or "freezing."

	✓	✓	✓	✓	✓
		✓	✓	✓	
				✓	

G-E 295-amp AC welders help Side-O-Matic Unloader Corporation fabricate truck-mounted concrete-block unloaders. Fabrication process requires welds on materials as heavy as 8-inch channel.

Low-cost General Electric 295-amp Welders Pay Off on Two Big-welder Jobs

High open-circuit voltage of General Electric 295-amp AC welders allows York-Shipley, Inc. to use required low-hydrogen electrodes with almost complete freedom from popouts—speeds production of heating-unit generators.

Production welding applications at two manufacturing plants in York, Pennsylvania again show how General Electric 295-amp AC general purpose welders deliver big-welder performance for the initial cost of the light-duty welder.

York-Shipley, Inc., a major manufacturer of heating and air conditioning equipment, uses G-E 295-amp AC welders in fabricating heating-unit generators for their oil and gas-fired residential furnaces.

Glenn C. Himes, production supervisor, reports, "In fabricating our heating-unit generators we have to use low-hydrogen electrodes to weld 'sandwiches' of mild steel, aluminized steel, and stainless steel. The high open circuit voltage of the G-E welders allows us to use low-hydrogen electrodes with almost complete freedom from popouts—something other machines we've tried couldn't manage."

Side-O-Matic Unloader Corporation, manufacturers of truck-mounted concrete-block unloaders, uses G-E welders exclusively in its manufacturing process.

Ralph Sheasley, shop supervisor for Side-O-Matic, says, "Our G-E 295-amp welders do a good job—under almost continuous operation. Fabricating our unloaders takes a variety of different welds on material as heavy as 8-inch channel. We get the high-quality, strong welds we need with these G-E welders."

See for yourself how G-E 295-amp AC welders can do big-welder jobs. Contact your nearby General Electric Welding Distributor (He's listed in the yellow pages of your phone book) or write for descriptive bulletin GEC-1305, Sect. 712-3, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

COMING EVENTS

SEPT. 17-21: Eleventh Annual Instruments-Automation Conference & Exhibit, Instrument Society of America, Coliseum, New York City.

SEPT. 19: New England Regional Welding Conference, American Welding Society, New England Mutual Hall, Boston.

SEPT. 20-21: Eastern Zone Meeting, National Welding Supply Association, Hotel Statler, New York City.

SEPT. 24-25: Central Zone Meeting, National Welding Supply Association, Hotel La Salle, Chicago.

SEPT. 24-28: X-ray Diffraction School, North American Philips Co., Inc., Sir Francis Drake Hotel, San Francisco.

SEPT. 24-28: Trade Fair of Atomic Industry, Atomic Industrial Forum, Inc., Navy Pier, Chicago.

SEPT. 25-27: Third Annual Atomic Industrial Forum Conference, "Management & Technology for Atomic Industry," in conjunction with Trade Fair, Morrison Hotel, Chicago.

OCT. 8-12: National Fall Technical Meeting, American Welding Society, Cleveland.

OCT. 8-12: Thirty-eighth National Metal Exposition and Congress, Cleveland Public Auditorium, Cleveland.

OCT. 22-26: National Safety Congress and Exposition, Chicago.

OCT. 29-30: West Central Zone Meeting, National Welding Supply Association, Hotel Nicollet, Minneapolis.

NOV. 1-2: Western Zone Meeting, National Welding Supply Association, St. Francis Hotel, San Francisco.

DEC. 3-4: Southeastern Zone Meeting, National Welding Supply Association, Dinkler-Tutwiler Hotel, Birmingham, Ala.

DEC. 6-7: Southwestern Zone Meeting, National Welding Supply Association, Statler-Hilton Hotel, Dallas.

JAN. 28-31, 1957: Eighth National Plant Maintenance & Engineering Show, Cleveland Public Auditorium, Cleveland.

JAN. 30-31: Midwest Welding Conference, Armour Research Foundation of Illinois Institute of Technology, Chicago.

MARCH 25-29: Tenth Western Metal Congress & Exposition, American Society for Metals, Los Angeles. Congress at Ambassador Hotel; exposition in Pan-Pacific Auditorium.

APRIL 1-3: Fifty-seventh Annual Convention, International Acetylene Association, Hotel Nicollet, Minneapolis.

APRIL 8-12: Fifth Spring and Thirty-eighth Annual Meeting, American Welding Society, Hotel Sheraton, Philadelphia.

APRIL 9-11: Fifth Annual Welding Show, American Welding Society, Convention Hall, Philadelphia.

MAY 13-16: Thirteenth Annual Convention, National Welding Supply Association, Hotel Mayflower, Washington, D. C.

Tig cutting saves time in tank plant

PARTS for aluminum tanks and tank cars are being fabricated at the Graver Tank & Mfg. Co., Edge Moor, Del., by means of manual and automatic Tig (tungsten inert-gas) cutting.

In Tig cutting, a very high-temperature, high-velocity, constricted arc ejects molten metal while the gas atmosphere prevents oxidation of the cut face.

At the Graver plant, automatic Tig cutting—with the torch mounted on a shape-cutting machine—is reportedly 10 times faster than sawing, the former metal-severing method.

Cutting a 54-in.-diameter dome hole in 5/8-in. rolled aluminum plate once took five hours with cold chisels. Manual Tig cutting reportedly does the job in 4½ minutes.

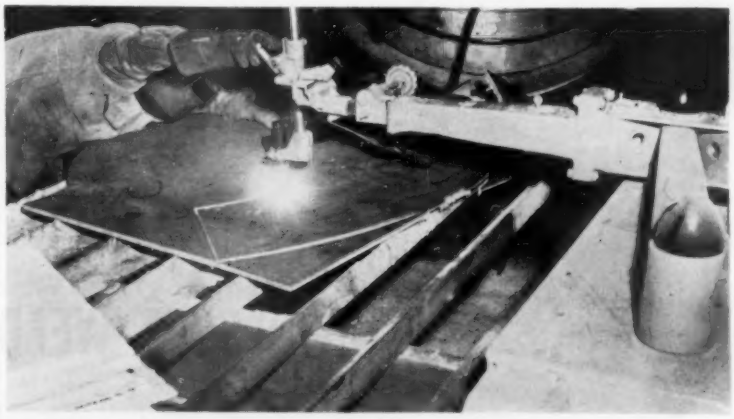
Less than a year ago, WELDING ENGINEER described the aluminum-cutting abilities of a modified version of the Tig welding torch *(Big switch makes Tig torch a cutter*, November, 1955, p. 51).

While the process has found widest application in aluminum cutting, it may also be used on magnesium and copper.

THIS 18-in. diameter hole in the 5/8-in. thick aluminum dome of tank car took 1¼ hours before Tig cutting was used. Hole is now shaped in one minute.

—Courtesy Linde Air Products Co.

THIS 11-in.-diameter hole took one hour to cut with cold chisels. The entire job is now finished in 45 seconds by the manual Tig cutting process. Tanks and tank cars are made.



TANK car stiffener pads were previously sawed by two men in 27 minutes. Now the entire cut is made in less than 2½ minutes by one man.

MAKE A FLUX DISCOVERY!

TEST OUR FREE FLUX SAMPLES

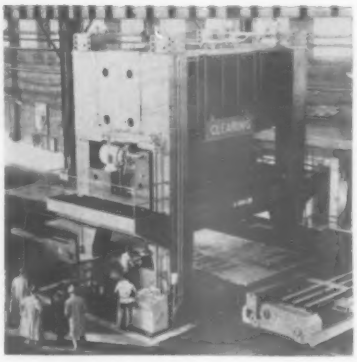
AT IT SINCE '93
ALLEN

You'll find Allen Fluxes safer, faster, more dependable! L. B. Allen, in the flux business over 60 years, is continually developing, constantly improving their complete line of fluxes for soldering, brazing, and welding. Just give us an idea of what job our samples should do—we'll send some to you quick!

Write: Dept. 6711A

L.B.ALLEN CO., INC.

6711A Bryn Mawr Ave.
Chicago 31, Ill.



—Lincoln Foundation photo

This behemoth is of welded design

ARMOUR plate 20 in. thick can be straightened by the huge welded hydraulic press pictured above. Built by Clearing Machine Corp., Chicago, the press has a capacity of 5,000 lb on its ram, which operates out of a traveling carriage between crown and bed.

Welded-steel plate was used throughout construction, including the bed, uprights, crown, carriage and feed cars. Plate thickness ranged from 1½ to 10¼ in. Because of thick sections, a great portion of the manual welding was done with E7016 (low-hydrogen) electrodes. More than 12,000 lb of electrodes were used in all.

Stress Relieved

Weldments were broken down into sub-units to permit downhand flat welding. After joining into completed elements, the size and sections involved indicated stress relief at 1,175 F.

The straightening ram, which is 52 in. in diameter, is actuated through a 53-ton forged-steel hydraulic cylinder on the carriage—the main working member. Carriage travel is 180 in.; distance between press uprights is 210 in.

The press weighs more than 600 tons—the bed alone (below floor level) scales 118 tons.

Versatility and flexibility of the welding methods aided in meeting delivery date on the press. It also obviated the high cost and delays involved in making patterns and castings.

NOW OVER 25,000 ~~23,000~~ IN USE

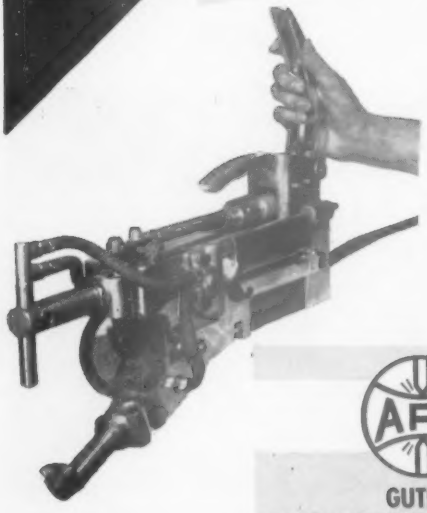
EASIER HANDLING

SAVES TIME — ARO — SAVES MONEY

Portable SPOT WELDERS

* No other machine of its size produces such high welding current
* Easy one-hand operation reduces fatigue . . . enables operator to maintain high production pace
* Easily adjustable spring pressure
* Trip-switch or timer according to model
* Air or water-cooled models

Air-Hydraulic and Air operated guns for high production also available.



ARO Model 192 with convenient lever to lower and raise bottom arm.

ARO SPOT WELDERS

Illustrated Literature on Request

DIVISION OF
GUTHERY MACHINE TOOL CORPORATION
38-31 CRESCENT STREET LONG ISLAND CITY 1, NEW YORK
Dealer Inquiries Invited

Impeller Come-Back Story

points way to *permanent* repair of damaged iron castings

Rocks almost scored a permanent knockout against this ocean dredge pump impeller. When big ones lodged in the pump and broke all three of the impeller vanes, the $1,200 special alloy iron casting seemed *impossible to save.*

But the owners knew how well Ni-Rod "55"* electrode welds cast irons to other metals. They decided repair was worth a try.

First, their weldor cut three vane sections out of one-inch thick steel plate. Then with just 4½ pounds of Ni-Rod "55" electrode, he welded the steel sections in position to the alloy iron.

The new sections *stayed* put . . . despite rocks . . . despite all the debris sucked up by the pump. The vanes, repaired with Ni-Rod "55" electrode, proved to be as good as new.

Weld cast iron to itself or other metals

Repairs like this one prove Ni-Rod "55" electrode joins cast irons to other metals like steel. And this easy-handling electrode gives you just as many advantages in welding cast iron to itself. Use A.C. or D.C. You get stable arc . . . smooth bead contour . . . easy slag removal . . . *strong, machinable welds!*

"A Handy Guide to Welding Cast Irons"

answers many welding questions. It's filled with illustrated case histories . . . technical data . . . helpful welding tips. A postcard brings your copy.

*Registered Trademark

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

$1,200 impeller seemed hopelessly damaged. But Ni-Rod "55" electrode joined steel plate to three iron vanes — saved the special alloy iron casting.

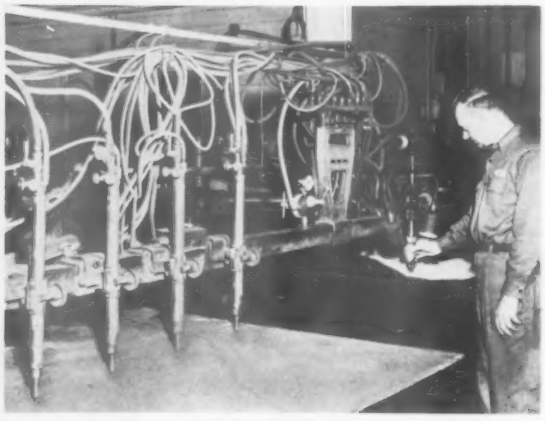
INCO TRADE MARK

Welding Products

Electrodes • Wires • Fluxes

new products . . . . . USE CARD ON PAGE 115

ELECTRODE is for semiautomatic hardfacing. It is prelubricated, allowing uninterrupted feed.



CUTTING torches arranged in tandem formation provide automation in flame-cutting.

Hardfacing

SPECIALLY developed "tube rod" electrode is for semiautomatic hardfacing. Although designed for use with the "AMSCO MF" semiautomatic welder, electrode may easily be adapted for use with most semiautomatic machines.

New electrode, 3/32-in.-diameter drawn tubular wire, performs much like mild steel solid wire in welder. Tube rod is round steel-wire shell; alloys are enclosed within shell. Shell is work-hardened to prevent deformation or snarling during welding.

Tubular construction of electrode allows use with feed rollers in a majority of semiautomatic hardfacing welders. Advantages of new electrode, states the manufacturer, are: high metal deposition, longer parts life, speed and ease of welding. Electrode is prelubricated, permitting uninterrupted feed. New electrode holder (provided) is claimed easy to handle.

Three electrodes are available: "S/A Manganese" for buildup, repair; "S/A 53" for general purpose usage, and where heavy impact and abrasion are encountered; "S/A 33" for applications requiring high abrasion resistance such as crusher rolls, tool joints. *American Manganese Steel Division.*

Circle No. 1.

Welding torch

WELDING torch features quick shut-off valve for production line, light-gage welding and brazing jobs. Known as "600 Shut-off" torch, it is especially suited for production welding in refrigeration and automotive industries.

Torch, which weighs 14 oz and is 7¼ in. long, features easy-grip oxygen and acetylene valve knobs; thumb-operated, quick-acting shut-off lever; chrome-plated welding tips for resistance to weld spatter. *Air Reduction Sales Co.*

Circle No. 2.

Rotary air grinder

PRIMARILY for precision die work, rotary air grinder is claimed equally adapted to production grinding or bench duty. A stream-lined lightweight unit, grinder "25G" is derived from manufacturer's "No. 2" series.

A thumb-type throttle controls power feed; exhaust position is 360-deg adjustable. Grinder weighs 2 lb and is 11½ in. long. Wheel size is 1¾ in. bonded capacity. It operates at 20,000 rpm on 90-lb air pressure. *Thor Power Tool Co.*

Circle No. 3.

Safety spectacles

PLASTIC smooth-hook temple is new feature of the "Retrax" temple for "Tuc-Away" and 'Visor-Tuc" safety spectacles. Hooks rotate through 360 deg, telescope in and out. Temple hooks are claimed unbreakable in normal use. Flexible hinges enable wearer to angle lenses for snug fit at cheek. *Watchemoket Optical Co., Inc.*

Circle No. 4.

Flame-cutting

AUTOMATION in flame-cutting is provided by system utilizing the "98-T" machine torch and the "48-DC" oxygen saver. Termed "Cut-O-Mation," the combination can be used in the metalworking industry. Cutting speeds are said to be increased 30 to 50%, oxygen consumed in preheat flames is reduced to 80% and overall oxygen consumption lowered by 20%.

In this system, several cutting torches are arranged in tandem and operated from a single station. The oxygen saver gives full, vigorous preheat flame. The system achieves best results when used with natural or propane gas. It may be used, however, with other fuel gases. *Harris Calorific Co.*

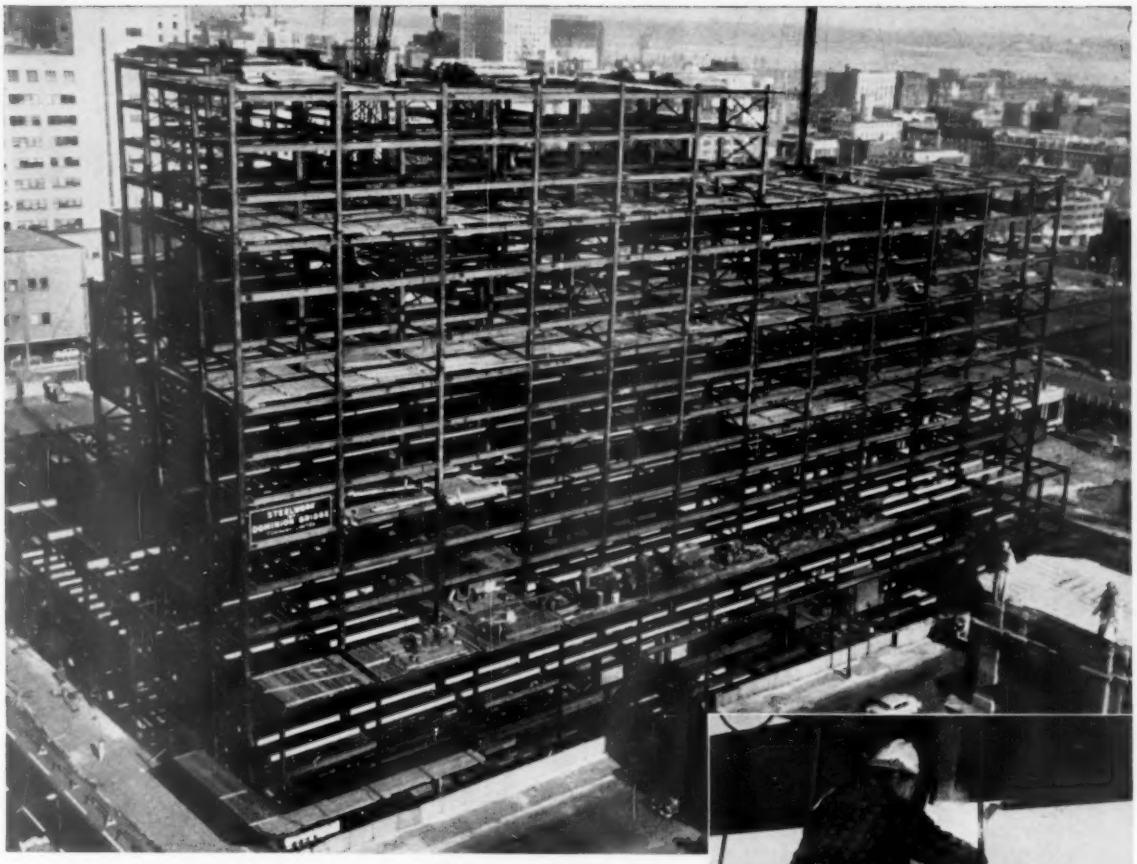
Circle No. 5.

Insulator

ELECTRODE insulator liquid is claimed to end shorts, down-time and reject welds when coated on electrodes, horns and holders. The Polinel "No-Short" insulator liquid bonds to metal because of its basic negative polarity. It is nontoxic, nonallergy-producing; can be used in insulation problems involving copper, steel, brass, silver or aluminum, states the manufacturer.

To use, clean metal to be insulated with gasoline or other greaseless solvent. Stir, dip or brush on, let set overnight. The insulator liquid is inflammable until set, warns the manufacturer. *Lovell Chemical Co.*

Circle No. 6.



High up in the steelwork where it's windy and exposed, welding can be a problem. But weldors are enthusiastic about Atom • Arc, not only for its speed but for its ease of operation in all positions and its materially reduced spatter.

Welded with ATOM•ARC 7016

Dominion Bridge Company of Canada is using Atom • Arc 7016 iron powder, low hydrogen electrodes* in welding the steelwork for this 21-story hotel. It's Canadian National Railway's new 20-million dollar Queen Elizabeth Hotel in Montreal.

Joining the lighter beams to the heavy columns without preheating called for low hydrogen electrodes. Atom • Arc 7016 electrodes in 5/32" diameters were adopted with the approval of both the weldors and Canadian National's inspectors. Along with the essential advantages of highest physical properties, x-ray quality weld metal and freedom from underbead cracking, Atom • Arc electrodes have a deposition rate much greater than standard 6010 electrodes. Starting porosity is eliminated and moisture pick-up is reduced.

Atom • Arc iron powder, low hydrogen electrodes have become standard on many structural and fabricated equipment welding operations. Find out why Atom • Arc is the first choice of users—write today for complete information. Alloy Rods Company, York 2, Pennsylvania.

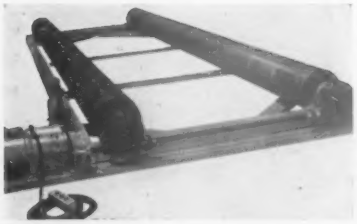
Alloy Rods Co.

General Offices and Plant
Lincoln Highway West
YORK 2, PENNSYLVANIA

Pacific Coast Sales Office and Plant
750 Lairport Street
EL SEGUNDO, CALIF.

no finer electrodes made... anywhere

ATOM • ARC is sold in Canada by Canadian LIQUID AIR Company, Ltd.



Fit-up Roll

PENDANT control, adjustable unit rolls, dual worm gear drive (both sides driving) are features of "UFR" fit-up roll for positioning. Variable-speed drive has speed of 6-60 ipm.

Unit is available in 5 to 50-ton capacities. An additional 20-ft section can be coupled together giving unit 40-ft length. *Unique Equipment Inc.*

Circle No. 7.

Abrasive cutting

ABRASIVE cutting machine is available as 10 and 12 in. type, portable or bench model. Unit can make fast, square and accurate cuts, states manufacturer. Included in the machine is a deburring unit. Square, burnished ends can be made, it is said, without clamping or using blades.

Deburring unit is mounted on special end bell housing of saw motor. Power is supplied by extension shaft. Operator inserts cut tube into opening in housing—rotates half a turn —in less than 2 seconds, burnished end is produced, it is claimed. *Wallace Tube Co.*

Circle No. 8.

Goggle cleaner

CLEANER and deodorizer is claimed to be effective for removing grease, grime and dirt from rubber, metal, glass, etc. It is said to be good for goggles, respirators, masks. A neutral cleaner, it rinses free in hard water. Termed "Sanitizer," cleaner is available in 1¼-oz. or quart-size unbreakable containers. *Pulmosan Safety Equipment Corp.*

Circle No. 9.

Weld repair kit

CRACKED blocks and heads can be repaired with new plug weld repair kit, states manufacturer. Two kits are available: "Starter" kit includes items average shop would require for its own use before offering plug weld repair service; "Master" kit includes complete tooling to handle any job.

Plugs are available in 8 sizes, with minimum diameters from 0.200 to 1.000. High speed taps include 7 sizes of regular taper and 6 of cut-off for use with blind holes. *Peterson Welding Laboratories, Inc.*

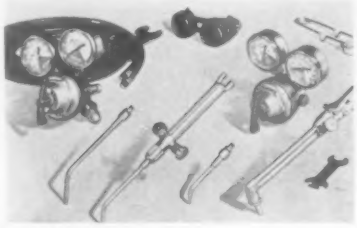
Circle No. 10.

Welding rod

EXTRUDED heavy-coated bronze oxy-acetylene welding rod is for braze-welding and welding malleable iron, cast iron, brass and bronze with dirty, oily or greasy surfaces. Three types are available: "Airco No. 20" bronze rod for general braze-welding; "Airco No. 22" manganese bronze for high-strength welds; "Airco No. 27" low-fuming bronze rod.

Rods are available in four diameters—⅛ in., 3/16 in., ¼ in. (36 in. long) and 3/32 in. (18 in. long). Smooth flow is assured, states the manufacturer, and coating cannot be knocked off in normal use. Also available with dipped coating for clean production work. *Air Reduction Sales Co.*

Circle No. 11.



Welding outfit

LIGHT range welding and cutting outfits contain in the new "Preso-O-Weld W-120" torch and "CW-120" cutting attachment. One kit is designed for aircraft welding; the other for light-weight welding. Both kits are designed for production welding and limited cutting of light metals. Regulators and hose lengths are the only differences between the two outfits. *Linde Air Products Co.*

Circle No. 12.

Brazing torch

UNUSUAL versatility is said to be feature of model "A" brazing and soldering torch. An all-brass torch with form-fitting wooden handle, it is for use wherever an adaptable tool is required.

Ready to connect to an acetylene line, torch has nine different tips for fine flame to broad burner. Unit may also be fitted with soldering iron tip. Torch is made of brass, except for stainless steel conical valve stem and handle. *Huber Industries, Inc.*

Circle No. 13.

Welding curtain

LIGHTWEIGHT nylon-plastic welding curtain is said to give protection against fire. Curtain does not absorb shop oils and greases and is flame-proof, states the manufacturer. Only one-third as heavy as cotton duck, curtain is easily handled, requires less storage space. Available in green, yellow and red, curtain offers continuous caution-zone partitions and also helps localize welding spatter. *Herculite Protective Fabrics, Inc.*

Circle No. 14.

Blast cleaner

AIRLESS abrasive blast cleaning machine has load capacity of 28 cu ft. Called "Super Tumblast," it is designed for cleaning sand, scale, oxides and other contaminants. Single-blast unit throws 830 lb of abrasives per minute. Machine employs only one abrasive hurling wheel. Newly-designed blades are claimed to give twice the life of conventional blades.

Separator is mounted at bottom of machine. Power-operated door is said to withstand impacts from inside and outside. The "Super Tumblast" lends itself to automated operation and reduces cleaning costs, states manufacturer. *Wheelabrator Corp.*

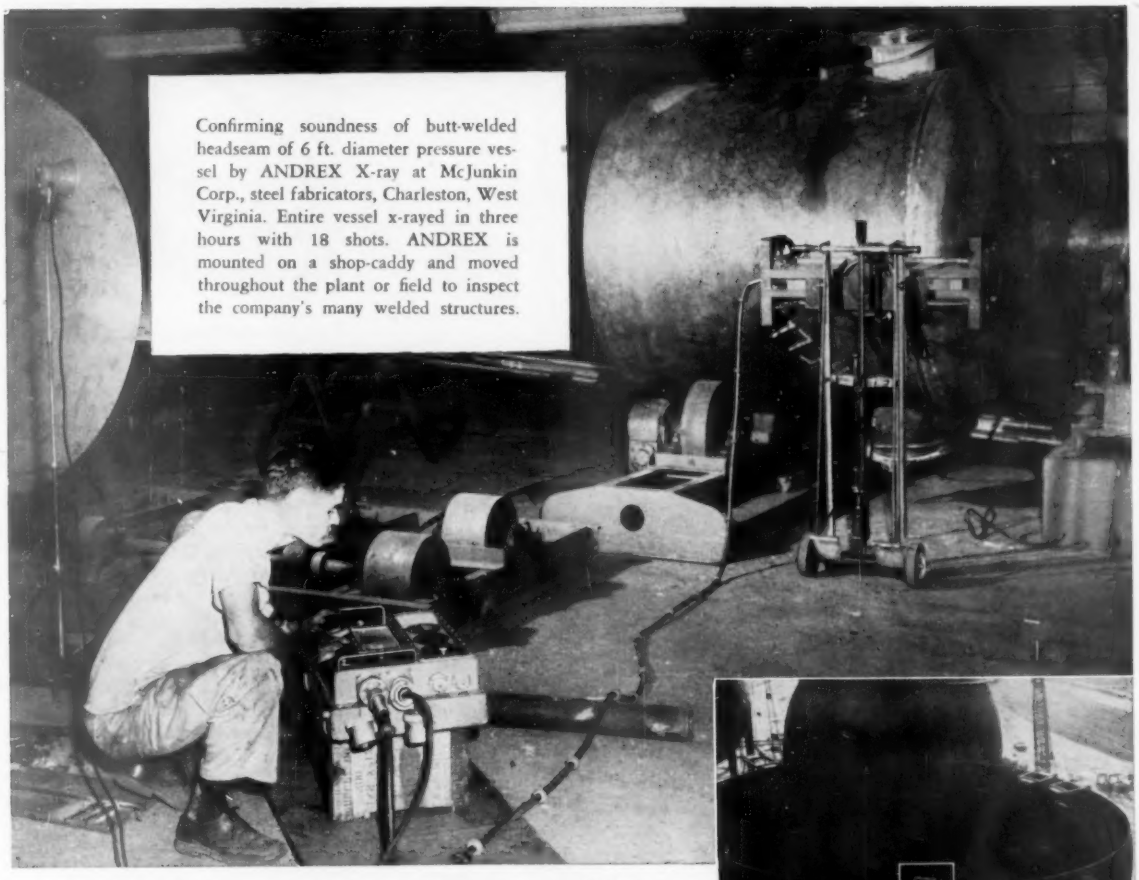
Circle No. 15.

Respirator

PROTECTION against respiratory hazards is given by four respirators, additions to the "R5000" series. The respirators are claimed to protect the wearer from inhalation of nonvolatile airborne particulate matter in form of dusts, sprays, mists, fumes.

The "R5561" is for operations involving volatile organic substances and vapors. The "R5562" is for acid gases. The "R5563" is for organic vapors, acid gases, and "R5564" protects against inhalation of ammonia and other alkali gases. Respirators have filter-adsorbent elements in cartridge form which fit regular respirator face pieces. *American Optical Co.*

Circle No. 16.



Confirming soundness of butt-welded headseam of 6 ft. diameter pressure vessel by ANDREX X-ray at McJunkin Corp., steel fabricators, Charleston, West Virginia. Entire vessel x-rayed in three hours with 18 shots. ANDREX is mounted on a shop-caddy and moved throughout the plant or field to inspect the company's many welded structures.

ANDREX PORTABLE X-RAY

non-destructive inspection of welded metal structures . . . fast, thorough, economical

X-ray, the preferred method of controlling weld quality, can be applied to plant and field work with the truly portable ANDREX unit. It is a compact unit consisting of a simple-to-operate control panel and an X-ray head that can be quickly and easily positioned anywhere. It provides a film record which either confirms the soundness of the weld or shows up both the nature and location of any hidden defect. Penetrating power is ample for practically all structures. Already in widespread use throughout the world, ANDREX is thoroughly dependable with over 2½ years of maintenance-free service being commonplace.

Write for further information on ANDREX X-RAY.

•

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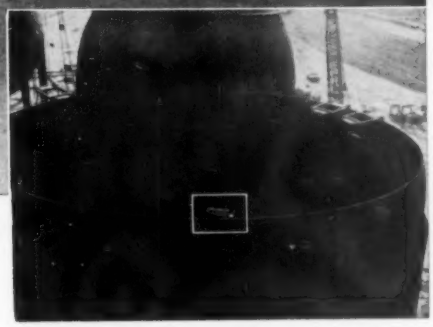
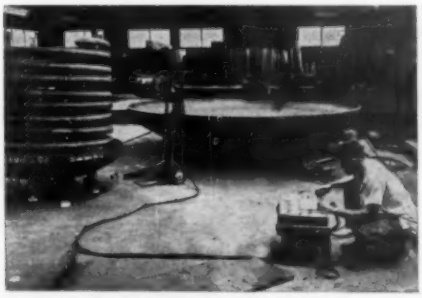


Maintaining quality control with 17,971 ANDREX X-ray pictures during construction of Hortonspheres for Calumet Nitrogen Products Co. by Chicago Bridge and Iron Co. 2000 to 2500 pictures per week taken at night so as not to interfere with work. ANDREX is mounted inside sphere and areas are traversed by turning machine slightly for successive pictures. As all pictures are taken under same condition, quality is constant.



ANDREX, in a setup similar to this one at McJunkin Corp., examines internal stainless steel coils for pressure vessels at Texas Pipe Bending Co., Houston, Tex.

AIRCOMATIC® welding wires

Pure...properly cast...level wound

Properly cast and carefully wound Aircomatic Welding Wires for use with the Aircomatic and Heliwelding processes are your assurance of reliable current pickup and smooth, uninterrupted wire feeding. All Aircomatic wires meet rigidly controlled specifications as to chemical analysis, surface finish, cleanliness and packaging, and are available in the widest variety of wire types and diameters.

Aircomatic Aluminum Welding Wires. Supplied on 10 lb. expendable spools . . . New Type A finish available for all high-quality work where X-ray standards must be maintained . . . scrupulously clean . . . bright finish . . . properly wound . . . smooth surface assures trouble-free feeding.

Aircomatic Stainless Steel Welding Wires. Supplied on 25 lb. expendable spools . . . excellent corrosion resistance . . . good tensile, ductility and impact properties . . . use to weld ordinary joints, apply stainless linings, build-up stainless overlays and join stainless clad materials.

Aircomatic Nickel Base Welding Wires are available in types to weld commercially pure nickel, Monel and Inconel. These metals can also be overlaid on mild steel or other materials . . . nickel wires supplied on 25 lb. expendable spools.

Aircomatic Copper and Copper Base Alloy Welding Wires. Use to assemble copper bus bars . . . fabricate copper or bronze vats . . . build-up worn propellers, piston and valve parts . . . supplied on 25 lb. expendable spools in both solid and stranded grades.

Aircomatic Steel Welding Wires. Three grades available for welding mild steel, armor plate and for overlays and welding hardenable steels . . . supplied on expendable spools, chip board cores, coils or Wirepaks.

Consult your nearest Airco Representative for technical or metallurgical information.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND . . .

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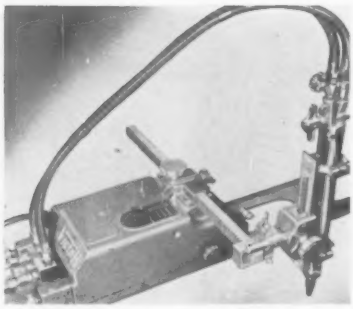
Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** — industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** — carbon dioxide, liquid-solid ("DRY-ICE") • **OHIO** — medical gases and hospital equipment • **NATIONAL CARBIDE** — pipeline acetylene and calcium carbide • **COLTON** — polyvinyl acetates, alcohols, and other synthetic resins.



Flame-cutting machine

STRAIGHT line cutting machine, "Model VU-120," is for cutting straight lines, square and bevel kerfs and circles. It can be adapted for various automatic electric welding applications.

A complete unit, it is designed for simple, convenient operation, states the manufacturer. A control lever for forward or reverse travel actuates a positive clutch. Clutch can be disengaged and placed in neutral position, allowing free wheeling and positioning at will, it is claimed.

Move lever in direction of travel and machine will progress as desired. Return lever to neutral and machine will stop instantly. Variable speed transmission allows wide range selection through constant speed drive motor. Unit weighs 35 lb; speeds from 0 to 180 rpm. *Victor Equipment Co.*

Circle No. 17.

Hardfacing

AUTOMATIC and semiautomatic hardfacing wire is claimed to make possible surfacing of worn parts with ease and reliability. Termed "Tube-Alloy," the new copper-coated, alloy-filled wire produces chemically uniform welds, states the manufacturer.

Use of the hardfacing wire assures uniform chemistry and hardness, it is claimed. Copper coating provides positive contact, prevents surface rust. Wire is color-coded for identification; available in layer-wound coils. Wire is available in ¼, 3/16, 5/32, ⅛ and 3/32 diameters. *The McKay Co.*

Circle No. 18.

Welding fasteners

WIDE variety of sizes and types of welding fasteners now offered include welding screws, spade and bent spade screws, collar studs and nuts. Designs available to meet special requirements. *Russell, Burdsall & Ward Bolt & Nut Co.*

Circle No. 19.

you know, this **miller** *AEA-200-L is quite a deal*

The man's right of course, and here's why: As a welder, it provides a full 200 amperes of ac welding current . . . handles ac or ac-dc electrodes up to 3/16". As a power plant, the rotating field design generator — coupled to Onan CK engine — supplies 4500 watts of 110/220 current; or, 1000 watts of dc power while welding. Waterproof and light weight (435 lbs.), the AEA-200-L offers easy portability, all-weather operation and real versatility. Rubber-tired running gear and road trailer available. Model AEA-200, without auxiliary power, weighs 420 lbs. Larger engine driven units to 350 amperes with generator output of 10KW.

". . . if it's MILLER you know it's the finest . . ."

New

MILLER ARCWELD welding electrodes are worthy of the MILLER name and reputation. Ask your distributor for some . . . you'll *like* the job they do.

miller

ELECTRIC MANUFACTURING CO., INC.
APPLETON, WISCONSIN

Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal, P.Q.

Phoson solves "hidden joint"

assembly brazing problems!

Everyday . . . this leading *manufacturer PHOSON brazes over 5400 hard to see and reach copper joints. Even though hidden deep down in air conditioning unit assemblies, "leaker" rejections are less than ½ of 1%!

High capillary attraction at low temperature, without flux, make United's Phoson 6 perfect for such tough "in close" brazing jobs.

Copper U-Bend Coil connections, too, are brazed best with Phoson 6 brazing rings making high-volume automation easy, effective and profitable.

For all types of hand fed or automatic copper brazing, Phoson 6 has every desirable characteristic you want . . . high capillary attraction, lowest possible brazing temperature, greatest resistance to vibration and lowest possible cost.

*Name on request

Contact your United Welding Supply Distributor or write . . .

Permanently United

UNITED WIRE AND SUPPLY CORPORATION

PROVIDENCE 7, RHODE ISLAND

COPPER, BRASS, ALUMINUM WIRE AND TUBING • BRAZING ALLOYS

Arc welder

INERT-gas arc welder is rated at 200 amp, 40 volts, and has a current range of 10 to 300 amp (a-c or d-c). It will be first shown at the coming National Fall Technical Meeting of the American Welding Society. Features include case with removable side panels; recessed control panel, and selector switch which permits operator to choose a-c/d-c straight or d-c reverse welding power. Unit also has magnetic contactor and removable rheostat for remote control. *Hobart Bros. Co.*

Circle No. 20.

Silicon rectifier

SUITABLE for battery-charging applications where high power d-c requirements exist and only a-c sources are avavilable, silicon rectifier weighs only 5 lb.

Unit occupies ¼ cu ft, is rated at 100 amp, 200 volts. It will rectify 20 kw of a-c power with an efficiency exceeding 98%, manufacturer states. *Bogue Electric Mfg. Co.*

Circle No. 21.

Brazing furnace

COMBUSTION-tube-type furnace can be used for production runs of small parts that are to be brazed, silver soldered, hardened, annealed, etc. The "Model CF-4SA" is a 4-kw electric resistance element furnace that accommodates one combustion tube up to 5 in. OD, with maximum furnace temperature of 2,750 F.

The unit can also be modified for use as a high-temperature pot furnace or a constant-temperature source for optical calibrations. Heat is supplied by eight silicon-carbide heating elements having an effective heating length of 8 in. *Lindberg Engineering Co.*

Circle No. 22.

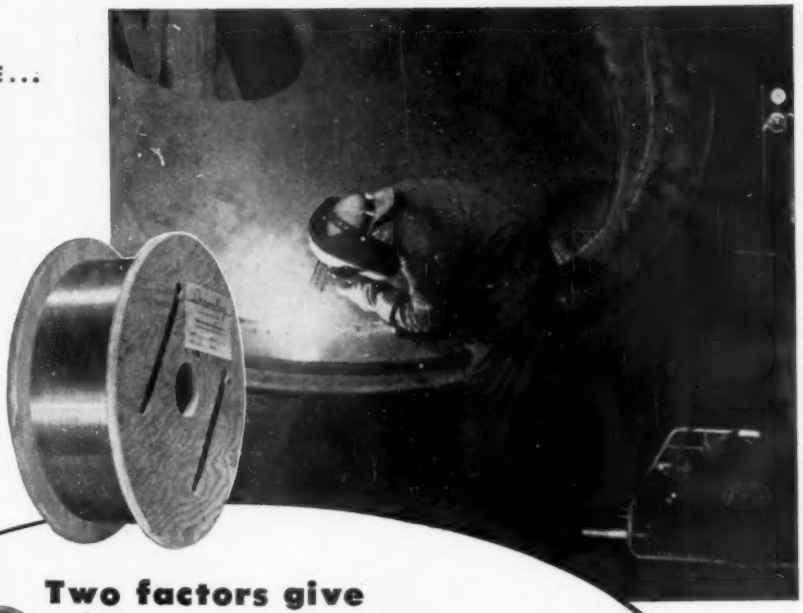
STAINLESS STEEL WELDING WIRE...

Spooled... layer wound to assure a smooth, even feed. Sizes: .035", .045", 1/16", 5/64" and 3/32" diameters.

Coiled... layer wound on rims for submerged arc welding. Sizes: 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.

Cut Lengths... straightened and cut wire furnished in 36" lengths for inert arc and gas welding.

Sizes: .035", .045", 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.



Two factors give

Drawalloy

CORPORATION

WELDING WIRE

best on-the-job performance

WEAR-O-MATIC HARD-FACING WIRE...

Coiled... precision drawn for perfect roundness to insure continuous, smooth feed with any automatic head. Available in six Types for hard-facing applications.

Drawalloy welding wire is a product of two factors—years of experience in the welding industry combined with the best wire mill drawing practices. The result is clean welding wire with the proper finish, temper, diameter tolerance and chemical analysis. It's a wire that produces the highest quality welds continuously—with an easy, sure feed and a constant, smooth arc.

See your distributor or write Drawalloy Corporation, Lincoln Highway at Alloy Street, York 12, Pennsylvania

Drawalloy

CORPORATION

The Wire Mill For The Welding Industry

YORK, PENNSYLVANIA

NEW IMPROVED HARD FACING

Tough, hard ceramic coatings provide superior bearing surfaces

Sprayed alumina forms "sapphire-hard" surfaces highly resistant to wear, abrasion and corrosion. Ideal for bearing surfaces, seals.

Development of the new METCO THERMOSPRAY GUN for spraying high-melting-point ceramic materials at low cost opens up a variety of new practical applications. One that has produced a great deal of interest is the use of sprayed alumina coatings for bearing surfaces and mechanical seals. This THERMOSPRAY 101 Ceramic Powder produces surfaces with a hardness of 9.0 on the Moh scale, (only the diamond rates 10.0) with excellent resistance to wear, abrasion and corrosion. When used in combination with special phenolic or furane plastic sealers it provides superior protection against many acids.

Another THERMOSPRAY Powder – 201 – is zirconia which is somewhat softer than No. 101 but provides superior heat-insulating properties. Melting point of this material is 4600° F. and particle hardness 8.0 on the Moh scale.

Hard-facing alloys of the self-fluxing, nickel-boron-silicon type in powder form can also be applied with the METCO Type P THERMOSPRAY GUN. These coatings may be fused, semi-fused, or left unfused depending on the hardness desired, from RC 30 to RC 65, depending on the alloy and the process used.

The new THERMOSPRAY GUN operates without compressed air, only oxygen and acetylene being required. The free-flowing THERMOSPRAY powders are fed to the flame nozzle from a hopper atop the gun, melted and propelled to the surface to be coated. These materials are sprayed many times faster (up to 15 sq. ft. per hour—.010" thick) than has been possible with equipment previously available. Deposit efficiencies are in excess of 95%. These factors result in extremely low coating costs.

Preliminary engineering data contained in Bulletin 127 covers ceramic coatings while Bulletin 126 covers the hard-facing alloys. Either or both may be obtained by filling out the coupon below or writing on your company's letterhead. No obligation, of course.

Pump rod sprayed with alumina provides superior protection against abrasion and corrosion.

free bulletins
(See last paragraph above)

The following trade names are the property of Metallizing Engineering Co., Inc. METCO®, THERMOSPRAY. °Reg. U.S. Pat. Off.

METCO®

Metallizing Engineering Co., Inc.
1127 Prospect Ave., Westbury, L. I., New York

Please send me ☐ free Bulletin 127 (ceramic coatings)
☐ free Bulletin 126 (hard-facing).

Name

Title Company

Address

City Zone State

Clamp cutter

CLAMP cutter is designed for removing hose clamps. Termed "Model D-550," 14-in.-long cutter is drop-forged, hi-carbon steel and features single cutting jaw; other jaw functions as buttress edge. Cutter has heavy-riveted, single-pin joint. *Punch-Lok Co.*

Circle No. 23.

Magnetron

KNOWN as "Type 6589," magnetron is a non-packaged, high-power, pulsed tunable oscillator, operating in the 10 cm region. It has a one-piece anode.

The magnetron can be substituted for non-tunable types "4J39," "4J40" and "4J41." It is used with an external magnet having a field density of 2,700 gauss in the air gap. Pulsed power output is 500 kw; pulse voltage is 26-30 kw. *Amperex Electronic Corp.*

Circle No. 24.

Force gage

HIGH capacity force gage is for number of testing applications. Available for either compressive or tensile tests, gage has range from 0-50,000 lb. Gage is compact, claimed ideal for tests where space is at premium.

Compression gage is 5½ in. high; thickness 3½ in.; 8 in. wide, with net weight of 30 lb. Tensile model is 10 in. high, thickness 3½ in., 8 in. wide, weighs 37 lb. *W. C. Dillon & Co., Inc.*

Circle No. 25.

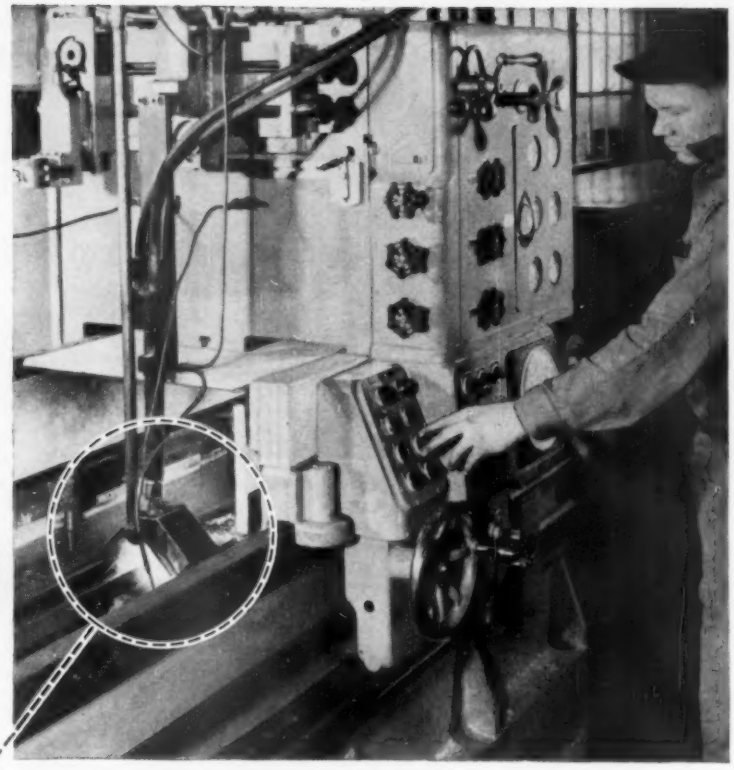
Wire straightener

AUTOMATIC wire straightening and cut-off machine can straighten and cut-to-length, wire of various sizes, shapes and materials. The high speed machine is electrically-operated with variable speed drive.

Machine has clutch and trip mechanism of positive, sensitive type. Wire-catcher pan runs full length of machine, is made in two sections joined by continuous piano-type hinge. Locking lever on extreme end of machine permits operator to empty the pan without handling cut lengths. *The Geo. C. Patterson Machine Co.*

Circle No. 26.

HIGH SPEED FLAME-HARDENING



Cross-section view shows uniform depth of hardened surface.

SPECIAL MACHINE UPS LIFE OF GRAPHITIC STEEL PARTS

LINDE engineers have assisted Cincinnati Steel Treating Company in developing a flame hardening machine which increases service life of 16 ft. long, graphitic carbon steel lathe ways . . . Development of this automatic, high speed machine is another example of how LINDE Service Engineers are helping LINDE's customers up production speed and unit quality through co-operative research engineering.

With this new machine, a lathe way to be treated is placed on a magnetic chuck in a water filled channel. Flame-hardening heads and control mechanism move at predetermined speeds along the part. After it cools, the lathe way is placed in a refrigerator for 24 hours which stabilizes the steel, and brings its case hardness to a minimum of 60 Rockwell "C" scale.

The benefits of LINDE's research, engineering, and over 40 years of accumulated know-how stand behind each of its customers to help them solve production problems. Get these "plus-values" which LINDE offers—it pays you to do business with LINDE.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
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GB Silver Brazing Alloys

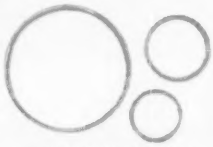
Used in Many Hospitals Where Safety Means Life or Death

Sound, leak-proof joints are a MUST in hospital construction requiring the piping of Oxygen and Anesthetic Gases to wards, rooms and nurseries *for instant use!* That's why leading designers and contractors specify dependable GB Silver Brazing Alloys, Preformed Rings and Fluxes.

GB Preformed Rings, for example, assure stronger, safer everlasting joints. They save time, require less metal, meet all specifications, cost less. Perhaps life or death are not a factor when you do silver brazing, but the dependability, efficiency and economy provided in GB products are good reasons for their choice . . . especially when they cost so little.

. . . Shown above is typical installation of oxygen wall outlet, snap coupler and flow meter. GB Preformed Rings are used to braze (1) wall assembly to screen; (2) tube to regulator; and (3) tube to gauge. For complete data write today.

GB FLUXES are fully active, deep penetrating, stable and economical. Produced under strict laboratory control they are extremely effective in producing high quality joints.



GB PREFORMED SILVER BRAZING RINGS are available in a wide range of sizes for all requirements. They are easy to use, save time and labor, assure lasting results.

GB SILVER BRAZING ALLOYS are made in random coils, strips and many special shapes in addition to preformed rings. Also available is Goldsmith's Technical Service Division cooperation for competent assistance in all brazing problems.

Dealer Distributor Inquiries Invited **Write for GB Data Book**

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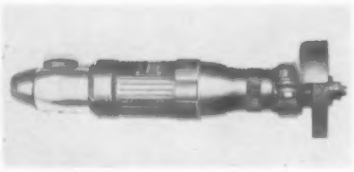

Rotary grinder

STREAMLINED lightweight rotary grinder is air-operated. The "3G" and the "3GE" are first units in new "No. 3" series. They replace the "No. 10" series grinders and the "OOH" model.

Five versions of "3G" are available, based on motor speeds of 7, 10, 12, 15 and 18,000 rpm. The "3GE" is available at 18,000 rpm only; it features a tapered extension spindle support. *Thor Power Tool Co.*

Circle No. 27.

Cables

IMPROVED method of color coding has been introduced for individual rubber insulated, neoprene jacketed conductors of multiple conductor power and control cables.

The new process consists of application of brightly colored synthetic rubber base coatings (supplemented where necessary by colored stripes) to the surface of the black neoprene jacketed conductors. *General Cable Corp.*

Circle No. 28.

Hot-melt compound

COMPOUND, "Hot-Melt H-883-A," is claimed to make machining of stainless steel honeycomb structures possible. Compound has low linear shrinkage; cells of stainless steel honeycomb are maintained during machining operation without collapsing or fraying, states manufacturer.

Compound is melted at temperature near 200 deg F in stainless or aluminum pans and honeycomb inserted. After cooling and machining, compound may be melted from honeycomb; final cleaning takes place with hot water. *Furane Plastics Inc.*

Circle No. 29.

E6010 Electrode

PIPE welding E6010 electrode is said to give smooth arc operation, deep penetration and good bead wash-in. Termed "Fleetweld 5-P," electrode can be used for welding pipe and pressure vessels.

Electrode is suitable for all-position structural welding, machinery weldments and ship welding. It is available in 1/8 and 5/32-in. diameters. *The Lincoln Electric Co.*

Circle No. 30.

another NEW product

MUREX®
SPEEDEX-U

Iron powder E-6013 type electrode

for dependable, high-speed, all-position welding

SPEEDEX-U, latest addition to M & T's Murex line, provides an iron powder, general purpose electrode for all position welding with either AC or DC. Its high rate of deposition, typical of all SPEEDEX iron powder electrodes increases welding speed and at the same time reduces costs. The slag which completely covers the deposits is easily removed. Operating with a quiet and moderately penetrating arc, SPEEDEX-U is an easy electrode to use . . . even in the hands of inexperienced weldors.

Don't overlook other Murex iron powder electrodes—SPEEDEX (E-6024 type); for flat or horizontal fillet work: low hydrogen SPEEDEX LH (proposed E-7028); and for all position welding: low hydrogen SPEEDEX HTS (proposed E-7018). Ask for details . . . Contact your distributor or nearest M & T representative.

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MUREX ELECTRODES • M & T ARC WELDING MACHINES • M & T EQUIPMENT FOR SEMI- OR FULLY AUTOMATIC WELDING • M & T WELDING ACCESSORIES • THERMIT® EQUIPMENT AND MATERIALS • KEL-RAY® PROJECTORS FOR RADIOGRAPHY

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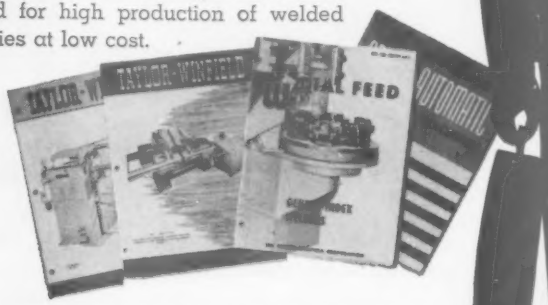
Field-proven standard and special welders designed for high production of welded assemblies at low cost.



PRODUCTION ANALYSIS

Special experiments in T-W Laboratory determine best welding technique, production equipment and practical design for your product.

LABORATORY REPORTS

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WARREN, OHIO

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OAKVILLE AND WINDSOR, ONTARIO

Metal cleaner

ALKALINE powdered compound is for removal of rust, paint and primer in one dip and rinse operation, states manufacturer. The "Turco Alkaline Rust Remover" is said to remove light rust in less than a minute. Heavy rust and multiple paint layers usually require only a few minutes immersion.

Remover is used in ordinary mild steel hot tank of welded construction. It requires no after-neutralization, just a pressure rinse. It is used at concentrations of 8 oz. to 3 lb per gal of water, depending on rust coating and time. Temperature should be kept between 200 F and boiling. *Turco Products, Inc.*

Circle No. 31.

Automatic welder

AUTOMATION is combined with projection and CO_2 arc welding in specialized automatic welder. Unit can weld, in assembly, two stamped spring-supported brackets to automotive rear-axle housing. It produces 130 welded assemblies per hour.

Machine is air-powered except for an inert-gas welding operation. Unit is 8 ft high, occupying floor space of 10 by 10 ft. It is an in-line transfer type machine. *Expert Welding Machine Co.*

Circle No. 32.

Barrel finishing

ALKALINE "FM 183" compound is designed for barrel deburring of small parts. The compound combines a fine, fast-cutting abrasive with surface active agents designed to keep media bright and sharp.

Used in concentrations of 1/5 oz per gallon of water, "FM 183" is for deburring of stamped or machined parts, grinding off sharp edges, removing tarnish, rust and heat scale, improving surface finishes and deburring steel and zinc. *Oakite Products, Inc.*

Circle No. 33.

L-H electrode

ELECTRODE is low-hydrogen iron-powder type for all-position welding of mild and low alloy steels. Termed "Easyarc 328," it is recommended for welding hardenable steels; cold-rolled steels; low alloy or mild steel, when stress relieving is required; weldments to be vitreous enamelled. *Air Reduction Sales Co.*

Circle No. 34.

BETTER FASTER
Low Temperature EUTECTIC WELDING ALLOYS
STRONGER WELDS

EUTECTIC WELDING NEWS

Plant, Research Laboratories and World Headquarters

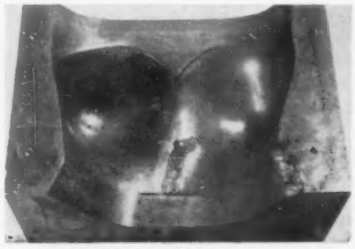
PUBLISHED BY EUTECTIC WELDING ALLOYS CORPORATION, 40-40 172 STREET, FLUSHING 58, NEW YORK, N. Y.
Warehouse-Service Centers in Atlanta, Chicago, Dallas, Berkeley, Montreal (Quebec), and other leading industrial areas.
In Canada: Eutectic Welding Alloys Company of Canada, Ltd.

NOW—KIRKSITE DIES CAN BE REPAIRED EASILY

Modern metallurgy has opened the door to a practical, low cost way to weld zinc die castings. This development by Eutectic Engineers permits repairing formerly discarded costly Kirksite dies.

Safe, sure, fast welding of zinc die castings is assured with EutecRod 196, the modern "Low Temperature Welding Alloy" specifically formulated for zinc alloys. This advanced alloy now saves industry thousands of dollars by reclaiming damaged and worn castings. EutecRod 196 is an easy-to-use bead forming alloy, perfect for build-up of worn or missing parts.

The low heat required eliminates the need to fuse and possibly damage the parent metal as with conventional welding materials. This means rapid joining of zinc die castings without puddling or melting the base metal, and preclusion of distortion or warpage caused by high heat. EutecRod 196 is used with Eutector Flux 196, applied first and heated. Liquefaction of the flux indicates the proper temperature for application.



Welded Kirksite mold ready for service

In addition to being a perfect color match for zinc die casts, EutecRod 196 is highly fluid. It can be used to join zinc die cast to other metals – brass, bronze, even aluminum. Large sections can be rebuilt by first melting the alloy on a cold plate and then joining the built-up alloy to the original part.

TOOL AND DIE SHOPS SAVE THOUSANDS WITH TINNING

Carburizing steel for tools and dies presents problems. It is often desirable to have parts of the metal remain soft for ease of subsequent drilling. Many tools require threading after carburizing. The usual process of welding pads on the piece before carburizing, and then machining off the pad, often leaves surplus metal when the pad is cut off.

Using Eutec-TinWeld, a paint-on, solder-type paste, also a perfect tinning compound, saves thousands of hours and dollars. Simply paint it over the area to be kept soft or protected. A torch melts the Eutec-TinWeld which later runs off during the heat treating. The area where it was applied remains soft. Base metal should be clean and oil-free before application.

"LOW HEAT INPUT" INCREASES PRODUCTION 500%

Excessive, costly rejects while fusion welding three copper pipes to a machined bronze casting led an Eastern manufacturer of heating equipment to check for savings with modern fabricating.

The brazing technique was tried. .388 ounce of filler alloy and nine minutes were saved on each assembly. A Eutectic District Engineer then suggested a cost analysis test with EutecRod 1801, a special capillary thin-flowing high silver alloy used with Eutector Flux 1801.

The three tubes were pre-fluxed and set up simultaneously; a large torch tip producing a broad flame was used. When the flux liquefied EutecRod 1801 was fed into the joint. The moving torch plus the superior capillarity of EutecRod 1801 prevented localized overheating and distortion as uniform fillets formed around the entire circumference of each tube.

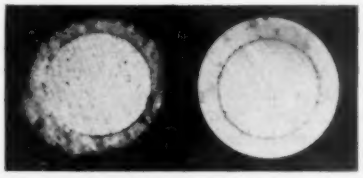
Even less skilled weldors produced perfect joints with thin flowing EutecRod 1801. Filler alloy required was cut from nearly two ounces of conventional alloy to 2/10 ounce of EutecRod 1801. Simultaneous joining of the three pipes increased production over 500%. The joints showed superior strength, corrosion resistance and "eye appeal." EutecRod 1801 reduced working temperatures at least 600 degrees F. Distortion and warpage were eliminated; the tubes perfectly parallel.

Overall view of the three fabrication methods. Left—fusion method showing heavy fillets, poor appearance and considerable distortion. Center—"brazing" results in better appearing, although still excessive fillets and some distortion. Right—EutecRod 1801 produces smooth, thin fillets and no distortion.

EUTECTRODE 2101 FOR ALUMINUM DRAWS APPLAUSE

A welding company writes us about "The remarkable performance of the new EutecTrode 2101 with extruded coating . . . in our early work, extensive tests were made using inert-gas arc, oxy-acetylene torch, and DC arc welding with commercially available aluminum electrodes, with hand dipped coatings. With EutecTrode 2101, we are able to get the desired quality of welds with 33% less preheat, 80% less rework to free slag in the difficult-to-reach areas, and with 25% less amperage. Superior wetting action with minimum spatter was apparent immediately."

Evidence of the superior performance of the new EutecTrode 2101 continues to come in. Air brake assemblies developing cracks from freezing were repaired using EutecTrode 2101, saving hundreds of castings costing $48.50 each. Spider ends of truck trailer wheels were repaired with fast melting, "Low Amp" EutecTrode 2101 without warpage or distortion. Housing for a Boston gear reduction unit was repaired in one hour with EutecTrode 2101 when mounting lug cracked. The repair was made with the lubrication left in the housing.



Conventional aluminum electrodes with hand dipped coatings (photomacrograph, left above) cannot provide the amazing arc stability, the absence of fingernailing and tailing, and the all-position weld-ability of the new EutecTrode 2101 with smooth extruded coating (right, above).

XYRON 2-25 SAVES $20,000 CONDENSER

A West Coast manufacturer expected a costly salvage job on a smashed $20,000 cast iron condenser. About 150 lbs. of the new, advanced, porosity and crack-free, strontium-aluminum bearing "Low Amp" Xyron 2-25 for cast iron and alloy cast irons produced a highly successful repair. "Eutectic's" ChamferTrode was used to chamfer out the cracks. The entire job was done in 99 man-hours.

Increasing use of nodular, ductile cast irons has introduced a new group of problems never before experienced in repairing and fabricating gray cast iron. Crack-free, Xyron 2-25 makes it ideal for the newest alloys. Its advantages over conventional nickel electrodes—essentially non-cracking and low heat input—makes it ideal for repair of cracked motor blocks, machine bases, motor and gear housings, transmission cases, cams, levers and for building up missing sections, filling in holes and defects.

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POCKET SIZE 168 PAGE GUIDE TO STRONGER, FASTER WELDING

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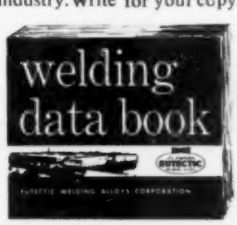

"EUTECTIC" WELDING HEADLINES • TIME-MONEY-MACHINERY SAVERS

NEWS . . . . . *from page 6*

area, incorporating as Webb City & Carterville Foundry & Machine Works.

In 1935 plans were made to include other types of machinery. One such was the manufacture of industrial scales. In 1939 the firm entered the welded construction field, developing a variety of welding positioners.

The firm name was changed in 1942 to its present title—The Webb Corp. The latest addition to the firm, in 1954, was the incorporation of The Reed Engineering Co., Carthage, Mo., manufacturer of welding fixtures. The Reed firm now operates as the Reed Equipment Division.

RW sales remain active

For the sixth consecutive month, members of the Resistance Welder Manufacturers' Association, Philadelphia, report new business totaling more than $3,500,000. New orders during June reached $4,000,000, bringing first-half 1956 totals 54% above the same period in 1955.

Boston conference announces program

The program for the New England Regional Conference on Welding to be held Wed., Sept. 19 at New England Mutual Hall, Boston, will include a variety of welding topics.

Sponsored by the Boston Section of the American Welding Society the program of six sessions will be followed by a social hour and dinner in the evening.

Speakers will be Dr. Harry Udin discussing the mechanism of brazing; Dr. Warren F. Savage on hot ductility studies; J. S. Boudreau on a weld crack susceptibility test; fabrication of titanium by C. E. Hartbower; recent advances in welding electrodes by Dr. Hallock Campbell, and inert-gas-shielded metal arc welding by Dr. J. S. Parks. The Boston Section hopes the conference, planned to stimulate exchange of technical ideas, will become an annual event.

New York distributors elect officers

New officers elected recently by the Welding Supply Distributors Association of the Metropolitan New York City area were:

Hans Weidig, Arc Welding Supply Co., Inc., Bronx, N. Y., president; L. Addis, Independent Welding Supply Co., Bronx, N. Y., secretary; Dave Bregman, Elk Welding Supply Co., Elmhurst, N. Y., treasurer.

3rd Midwest conference set for January, 1957

Conditions under which welding is economical in manufacturing processes will be one of the topics discussed at the third annual Midwest Welding Conference, to be held Jan. 30-31, in Chicago. Which welding process is preferred for a particular job is another subject on the agenda.

Sponsored jointly by Armour Research Foundation of Illinois Institute of Technology and the Chicago section of the American Welding Society, the event has drawn top speakers and guests the past two years.

About 300 persons will probably be on hand, according to Harry Schwartzbart, conference chairman and supervisor of welding research at ARF.

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175	438	1250
188	450	1300
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213	475	1400
225	488	1450
238	500	1500
250	550	1550
263	600	1600
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288	700	1700
300	750	1750
313	800	1800
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350	950	1950
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Master Tank builds new Illinois plant

Master Tank & Welding Co., Dallas, has begun construction of a new plant in Quincy, Ill., for the production of LPG tanks. Of all steel construction, the new main plant will be 60 by 220 ft. There will be 15,000 sq ft of manufacturing space in addition to an office building. The plant site includes 10½ acres of ground.

The modern propane tank manufacturing plant will have more than 1,500 ft of power conveyors and a 10-ton overhead crane. Production will include LPG tanks, air-receiver tanks and all types of pressure vessels. According to Master Tank, within a year, production will be doubled for manufacture of large storage tanks in capacities to 30,000 gal. Sam Weempe, Jr., has been named plant manager.

Canadian CGA holds meeting

The annual Canadian Section meeting of the Compressed Gas Association will be held Sept. 10-11 at the Seigniory Club, Montebello, P. Q., Canada.

Sommerfeld holds welding festival

A fall welding festival and equipment exhibit, open to the public, will be held by Sommerfeld Welders' Supply Co., Inc., at its store on N. Jackson Drive, Oshkosh, Wis., Sept. 19 and 20, from 3 to 10 p. m.

There will be demonstrations by representatives of exhibiting manufacturers of Tig welding, Mig spot welding, flame-cutting, hardfacing, plow welding, and other welding applications and processes.

Continuous color motion pictures on various phases of welding and cutting will be shown. As an added feature, there will be a new color cartoon on the use of oxygen for medical purposes. Refreshments will be served both days, with door prizes for guests.

NWSA to hold zone meetings

September will see the first of the season's zone meetings of the National Welding Supply Association. The Eastern Zone meeting will be held Sept. 20-21 at the Hotel Statler, New York City. The Hotel LaSalle, Chicago, will be the scene of the Central Zone Meeting, Sept. 24-25.

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HOLDS ODD SHAPES FOR ALL TYPE WORK

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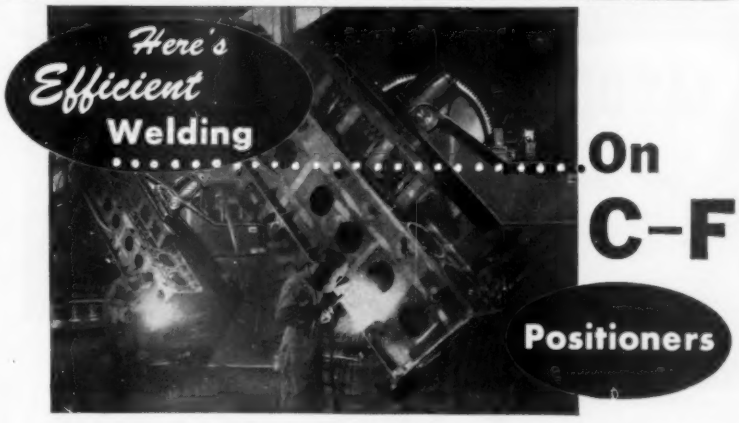

When heavy, unwieldly weldments like these diesel crankcases can be quickly swung into any position so that every weld is made *downhand* —that's efficient welding!

Welders spend more time welding—do better welding at lower cost when they work with C-F Positioners because these hand and/or power operated machines reduce positioning time to a minimum. Investigate the cost-saving advantages of C-F Positioners. They pay their way in any company.

Write for Bulletin WP26—an illustrated circular detailing the Specific advantages of C-F Positioners.

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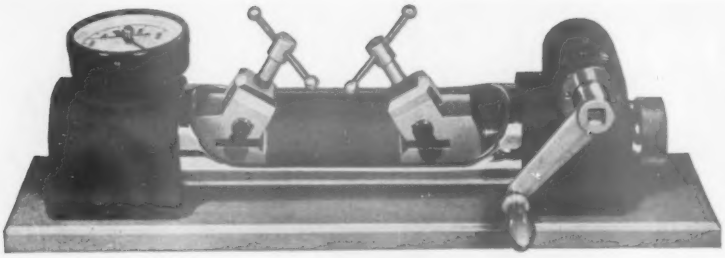
CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds



For shop or field—a new

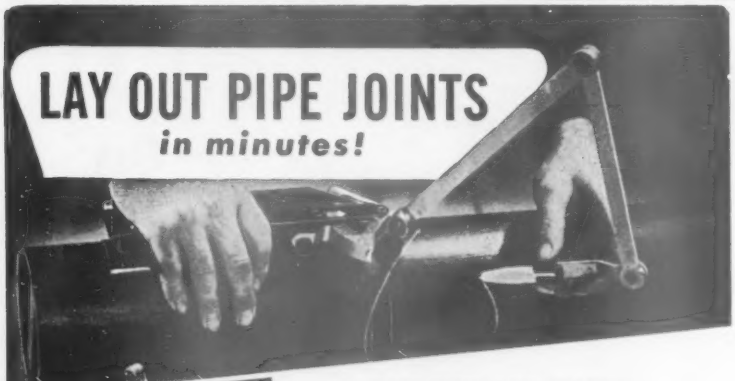
Portable Tensile Tester

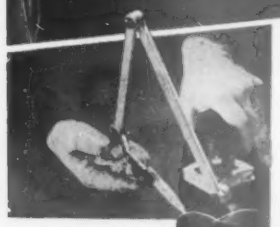
Use this compact, precision tensile tester to test strip steel, wire, bolts, spot welds, or anything else within its 4,000 lb. capacity. Besides its use for inspection work in the shop, this portable device provides a convincing method of demonstrating the tensile strength of various materials in sales demonstrations and trade shows.

Only a moderate pull on the crank is sufficient to apply the maximum load. Results are easily read from the load gauge. Simple to use, anywhere, any time. Write for catalog sheet and price.

DETROIT TESTING MACHINE COMPANY

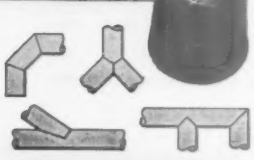
9380 Grinnell Avenue, Detroit 13, Michigan





SAVE TIME AND MONEY!

A SMOOTH SWING of the Contour Marker's soapstone point and you're ready to cut! It's easy and *absolutely accurate* because there is an angle dial calibrated in both degrees and pitch. Any of the pipe joint angles shown can be marked off in minutes. And you save "man hours" as well as oxygen and acetylene gas because "cut and try" methods are completely eliminated. Two sizes are available complete with adapter for marking structural steel. Standard, for pipes from 1½" to 18" dia.; Jumbo, for pipes from 16" to 48" dia. Instruction book included. Belt case available. Write for information



CONTOUR MARKER CORPORATION OF CALIFORNIA
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THE CONTOUR MARKER

National Carbon Co. to open laboratory

The new Parma, Ohio, research laboratories of National Carbon Co., a division of Union Carbide & Carbon Corp., New York City, will be dedicated Sept. 18. Designed primarily for basic research in chemical and solid-state physics, the multimillion-dollar laboratory brings to seven the number of major research centers operated by divisions of Union Carbide.

The new laboratory facilites are already in operation with research scientists studying ways to improve existing materials. An important part of the work will be devoted to creating methods for development of new materials for the metal, electronic, and electrochemical industries.

The laboratory contains 175,000 sq ft of floor space and is located near the center of a 126-acre plot on Snow Road in suburban Cleveland. The main building consists of 158 individual laboratory research units. Adjacent wings house machine shop, library, chemical engineering and laboratory furnace areas. Dr. Robert G. Breckenridge has been named manager.

Reverse lend-lease brings welder to U. S.

A motor-generator welder built in Switzerland has been acquired by the engineering school of North Dakota State College at Fargo. The d-c machine has been loaned to the school on a long-term basis by the manufacturer, Brown, Boveri & Co., Ltd., of Baden.

John H. Forrer believes this is the only type "GSM" welder operating in the United States. The GSM has a dual range of 35-70 amp and 70-375 amp. An automatic signal warns the operator of an overload.

Mr. Forrer considers the Brown, Boveri welder a valuable addition to the welding laboratory of North Dakota State.

Plan Canadian aluminum expansion

An expansion program for aluminum production has been announced by Aluminum Ltd., Canadian aluminum producer. The projected $250,000,000 program will provide for construction of a great new hydroelectric project on the Peribonka River in northern Quebec to support a minimum of 150,000 tons of new aluminum smelting capacity in the Saguenay district.

Atomic trade fair to highlight welding

The need for specialized welding techniques and equipment for the atomic energy field will be highlighted at the forthcoming 1956 Trade Fair of the Atomic Industry to be held Sept. 25-28 at Navy Pier, Chicago.

Sponsored by the Atomic Industrial Forum, Inc., New York City, the fair will reflect welding for atomic energy in a wide range of exhibits from metal suppliers and fabricators, pressure vessel manufacturers, suppliers of special structural and reactor components and builders of non-destructive testing apparatus.

Running concurrently with the Trade Fair will be the annual Forum conference on "Management and Technology for the Atomic Industry."

For more information address the Forum at 260 Madison Ave., New York City. *(See also calendar of coming events in this issue.)*

Electronic forum on tap for Chicago

More than 100 technical papers and 235 commercial exhibits will be featured at the 12th annual National Electronics Conference in the Hotel Sherman, Chicago, Oct 1-3. A record attendance of 10,000 is expected at the three-day meeting. The conference will discuss electronic research, development and application.

Worthington host to Spanish engineers

Thirty-one graduates of the School of Engineering, Madrid, Spain, on a 25-day tour of various American industries, recently visited the plant of the Harrison division, Worthington Corp., Harrison, N. J.

CGA and IAA set oxygen standards

A committee of the Compressed Gas Association and International Acetylene Association has developed standards for installation of bulk oxygen systems. Presented to the National Fire Protection Association, the recommendations have been approved in draft form. Under the NFPA procedures the tentative standard cannot become a full standard before the NFPA convention in May, 1957. Suggestions for improvement of the standard are invited from the oxygen industry prior to Feb. 1, 1957, so that any changes may be incorporated.

Now, Let's Get Down to Facts about CLAIMS - -

Yes, we could run a full page telling you why we say our HI-AMP products are superior to all other types, but we prefer to have

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ELECTRODE HOLDERS

prove their many outstanding advantages by actual test with others. That's why we say, have your Welding Supply Dealer demonstrate a HI-AMP and you'll "see" why Welders everywhere prefer it.

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THESE TWO FIXTURES CAN GIVE YOU ACCURATE – SMOOTH – PRESSURE TIGHT Fusion Butt Welds

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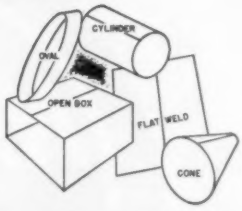

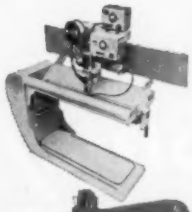

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Longitudinal Welding Fixture

Manufactured in 2 ft. to 12 ft. lengths. "Toe touch" control permits controlling fingers from any position. Welds sheets, cones, cylinders, boxes, etc., from .010 to one inch thickness. Suitable for MIG, TIG, submerged-arc and hand welds. Available also as complete package.

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Planishing Roll—60 Inch Throat

High Roller Face Pressure. Cold works welds and adjacent areas, flattens and smooths fushion welds, increases mechanical properties, reduces grinding. Also flattens flash welds, mash welds, resistance welds and elongated weld areas. Diameters 1¾ in. to 10 ft., and to 10 ft. lengths on large diameters.

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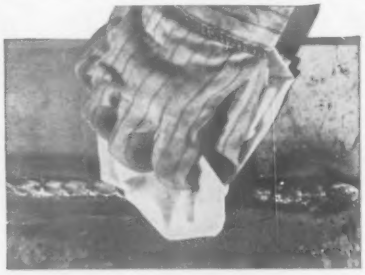

cut weld cleaning time by 85%

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P-O-M No. 2. Non-inflammable, non-toxic, water-soluble paste. Inorganic. Thin before applying and start welding at once. $3.30 per gallon, f.o.b. Dayton.

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National Carbide Company

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A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

Walmet Corp. in new facilities

Walmet Corp., located in Detroit's suburban Madison Heights, has completed facilities for developing and manufacturing cemented carbides. The newly-formed firm will produce special grades of carbide blanks and shapes for metalcutting, forming, wear-resistance applications.

ASEE meeting sees lack of teachers

The 64th annual meeting of the American Society for Engineering Education was held recently at Iowa State College, Ames. In addition to reports on current projects of the society, attention was focused on such topics as the impact of research on engineering education, the crisis in college faculty, future trends in supply and demand for engineers.

Of particular interest was the report of the committee, headed by A. R. Hellwarth, assistant to director of employment, The Detroit Edison Co., on the status of engineering instructors.

According to the committee, engineering colleges of the United States have experienced a net loss of 3% of their professors to industry within two years. The committee pointed out that the colleges will need 1,300 more teachers to carry the 1956-57 load. Higher salaries in industry were cited as the major lure for the movement of teachers into industry. The committee also stated that the teacher shortage is a concern industry must share with the colleges or the supply of engineers will be seriously threatened.

NWSA names chairmen for year 1956-57

The National Welding Supply Association, Philadelphia, has announced committee chairmen for the year 1956-57, as follows: E. C. Caluwaert, catalog committee; W. T. Hart, educational committee; R. P. Tarbell, industry relations and publicity committee; Glenn G. Garman, organizational and constitutional committee; Charles E. Squibb, membership committee; William A. Rice, future convention sites committee; A. C. Earlbeck, convention committee; E. C. Caluwaert, budget and finance committee. Mr. T. B. Jefferson, editor and publisher of WELDING ENGINEER, is a member of the catalog committee and of the industry relations and publicity committee.

California supplier opens new store

A new California branch store was opened recently by V. B. Anderson Co., Santa Ana, Calif., welding supplier. The new store, located at 133 W. Orangethorpe, Anaheim, will service northern Orange county. The parent store, located at 117 Spurgeon St., Santa Ana, has been servicing Orange country for the past 28 years.

Standards engineers to hold meeting

Technological problems of today and possible solutions through applications of standards will be considered at the 5th annual meeting of the Standards Engineers Society, Camden, N. J. The meeting will be held Oct. 3-5 at the Hotel Willard, Washington, D. C. Among topics discussed will be the future trend of standards in the metals field.

Distributor appointments

General Electric Co., Welding Department, Schenectady, N. Y.: DuPuy Oxygen & Supply Co., Waco, Texas.

Miller Electric Mfg. Co., Inc., Appleton, Wis.: McQuay Supply Co. Las Vegas, Nevada; Anderson Welding Supply Co., Aberdeen, S. Dak. Welding Materials Mfg. Co., Fitchburg, Mass.

Rankin Mfg. Co., Alhambra, Calif.: A & R Equipment Co., Ontario, Calif.: Alloy Welding Supply, Inc., Portland, Ore.; A & R Equipment Co., San Bernardino, Calif.; Barnes-Duff, Inc., Oxnard, Calif.; Gordon Duff, Inc., Los Angeles; Key Equipment Co., Oakland; Pasco-Yakima Welders Supply Co., Pasco, Wash.; San Diego Welders Supply Co., San Diego; Superior Oxygen Service, Ukiah, Calif.; Plateau Equipment Supply Co., Grand Junction, Colo.; General Welder, Denver; P. K. Welding Supply, Vinita, Okla.; Industrial Oxygen & Supply, Dallas; National Oxygen & Equipment Co., Quincy, Ill.; South Side Welding Supply Co., Chicago; H. R. Toll Co., Minneapolis; Central Welding Supply Inc., Fond du Lac, Wis.; Botts Welding Service, Woodstock, Ill.; Action Welding Supply Co., Baton Rouge, La.; Kanawha Steel Equipment Co., Charleston, W. Va.; Kanawha Steel Equipment Co., Weirton, W. Va.; Southern Auto & Welders Supply, Tallahassee, Fla.; H. Steele, Gainsville, Ga.; Middle Georgia Oxygen Co., Macon; Adelson-Werts, Inc., Hartford, Conn.; J. W. Goodliffe & Son, Allentown, Pa.

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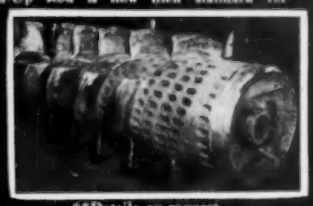
10 lb. No. 13 will start saving money for you. Comes bare or flux-coated.



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WALL CHART TO HELP YOU SELECT BEST FOR JOB FROM 86 ALL-STATE PRODUCTS

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the **MODEL "O"**

a Pipe Beveler with a Cutting Range of

1½" to 4"

PAT. APPLIED FOR

★ PERFECT BEVELS AT MAXIMUM SPEED
★ COMPLETELY PORTABLE (Weight: 7½ lbs.)
★ EASY TO OPERATE
★ NO MORE HAND-CUTTING

Employing the same split-gear horseshoe principle as H&M's larger models, the Model "O" offers the maximum in speed and *quality of bevels* on small diameter pipe! Rugged and dependable, regardless of job conditions, H&M's Model "O" is easily operated by unskilled operators. Changing from one size pipe to another is a matter of seconds with precision-made adapters. *Get detailed information on the fast-selling Model "O" from your nearest dealer or the factory at once.*

H&M PIPE BEVELING MACHINE CO.

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OUTSTANDING

COYNE ACETYLENE CYLINDERS ARE UNSURPASSED IN SAFETY, RUGGEDNESS, QUALITY OF WORKMANSHIP AND ACETYLENE CAPACITY. EACH STAGE OF MANUFACTURE IS CLOSELY SUPERVISED BY HIGHLY TRAINED TECHNICIANS WITH MANY YEARS OF EXPERIENCE IN THE ACETYLENE CYLINDER AND ACETYLENE GAS INDUSTRY. ALL CYLINDERS EXCEED INTERSTATE COMMERCE COMMISSION SPECIFICATIONS ICC 8 AND ICC 8 AL.

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Cutting to 4" ... Welding to 1"

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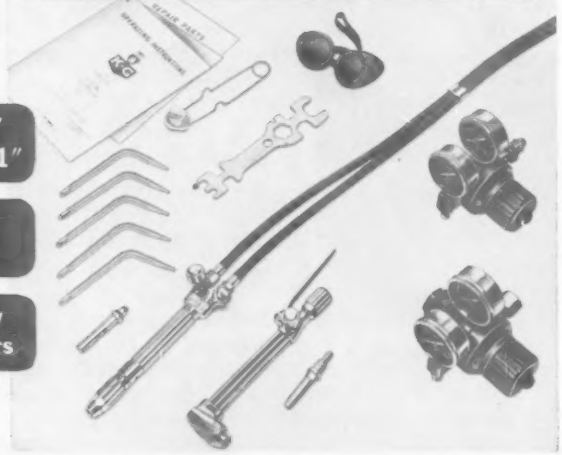


You get K-G's "All Purpose" AP Combination Welding & Cutting Torch with Monel head on both torch and cutting attachment, hand-tight seals, etc . . . easy-to-insert welding and cutting tips . . . new single stage or two stage K-G Regulators with amazing performance, simplicity and life . . . quality accessories. Also APM (Medium Duty) and APL (Light Duty) Outfits. Call your K-G Distributor, or write to *The K-G Equipment Co., Inc., Dept. A, 1744 Lehigh St., Allentown, Pa.*

AP WELDING & CUTTING OUTFIT

for the best in welding and auxiliary cutting

Bill Speer has been elected president of Acme Welding Supply, Inc., Houston. *H. L. Bradley*, formerly connected with Bradley Industrial Supply Co., Borger, Texas, has been named vice-president. Mr. Bradley was recently assigned interest in Acme Welding by *Howard Proctor*. Mr. Proctor plans to remain with the company in an active capacity.

Fred A. Kaufman, vice-president of manufacturing and sales, and *Dr. David Helm*, vice-president of research, have been elected directors of The McKay Co., Pittsburgh. Mr. Kaufman was also elected to the board of Surface Chemicals, Inc., a wholly owned subsidiary of McKay.

Robert Nordin has been appointed regional manager for All-State Welding Alloys Co., Inc. His territory will include the southern gulf states. Since joining All-State in 1954, he has been active in working with distributor personnel teaching use and application of advanced alloys and fluxes. Mr. Nordine is a member of the American Welding Society.

John D. Gordon has been elected vice-president and general manager in charge of all company operations by Progressive Welder Sales Co., Detroit. He recently joined the firm as sales manager.

Dr. Bennett S. Ellefson and Marion E. Pettegrew have been elected vice-presidents of Sylvania Electric Products Inc., New York City. Dr. Ellefson will be responsible for planning and coordinating engineering and research. He had been technical director. Mr. Pettegrew will be responsible for tungsten-chemical and parts operation. He was previously general manager of the parts division and the tungsten and chemical division.

Carl

Oberst

Norman Carl has been appointed vice-president of sales and *Jack Oberst* has been appointed general sales manager of Ohio operations by The Burdett Oxygen Co., Cleveland. Mr. Carl was formerly assistant vice-president and sales manager of Burdett. Mr. Oberst has been associated with the Burdett sales department. Both are members of the American Welding Society.

William J. Reitz and *David Locke* have joined the sales staff of Weber Welding Supply Co., Pittsburgh. Weber Welding Supply Co. formerly operated as Weber-Semmer Co.

Peter D. De Leo has been named engineer consultant by Progressive Welder Sales Co., Detroit.

Donald W. Oakley has been named technical advisor to the president by Metal & Thermit Corp., New York City. He succeeds *A. James Fisher* recently named general sales manager.

Einar Iverson has been appointed to the sales staff of Alloy Rods Co., York, Pa. He will work in the midwestern territory.

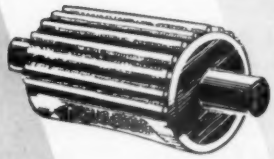
Lee Nunley has been promoted to assistant to the president of Dye Oxygen Co., Inc., Phoenix, Ariz. He has been associated with Dye Oxygen for several years, most recently as purchasing agent. He is a member of the American Welding Society.

Claude Flory has been named branch manager of the new Little Rock, Ark., store of Delta Oxygen Co., Memphis. Mr. Flory formerly was associated with National Cylinder Gas. Co. in the Little Rock area.

Robert H. Kular has joined the editorial staff of WELDING ENGINEER as an assistant editor. Mr. Kular was recently graduated from the University of Illinois' school of journalism and communications.

FASTER..

than drop-by-drop buildup methods!



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11%-13½% MANGANESE-NICKEL STEEL ROUND APPLICATOR BARS

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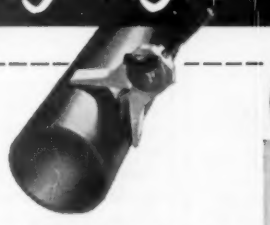
NEAREST DISTRIBUTOR UPON REQUEST

DIAL SET LEVEL

MARK A CENTER LINE at any angle

DIAL SET 45°



TO ESTABLISH AND MARK a point at any degree of angle on shaft, pipe or tube without numerous calculations or "cut and try" methods use the Boyce Centering Head. It's a must for welders, machinists, pipe fitters and boilermakers because it is *absolutely accurate* and saves time. Small enough to fit in your pocket, it weighs only 9 ounces. Order yours today or write for information.

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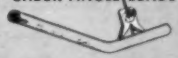

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Choose Huntsman angle-shape for

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For Brass, Bronze, Copper, Steel, Malleable Iron, etc. Causes the bronze to penetrate deeper into the joint—making a stronger union than is possible with other fluxes. High efficiency makes it more economical to use. Melting point 300°.

ALSO

1—Cast Iron Welding Flux
3—Brass, Bronze Welding Flux
4—Flux for Bronze Welding Cast Iron
5—Extra Quality Aluminum Flux for Cast Aluminum Welding
7—Steel Flux
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9—Stainless Steel Flux
11—Tinning Compound
12—Burnt Cast Iron Welding Flux
13—Brazing Flux for Extruded Bronzes
14—Special Brazing Flux for Aluminum Bronze, Everdur, and all Silicon Bronzes
15—Special Flux for Magnesium Alloys, Dow Metal, etc.
16—Silver Solder Paste Flux

FOR THE BEST JOB AT LEAST COST

Weldors can save more money and get a better job on production work, making special tools, and repair work with the right Anti-Borax product—**order by number.** Send for **free sample** and descriptive Circular.

ANTI-BORAX COMPOUND CO., INC.
FORT WAYNE, INDIANA

Lawrence C. Connolly has been named sales and service engineer for the middle-Atlantic states by Wall Colmonoy Corp., Detroit. He will headquarter in Morrisville, Pa.

Murl A. Rogers, Jr., has been named general manager of District Oxygen Co., Inc., Brentwood, Md.

Henry W. Kreifeldt was recently appointed sales manager of Morton Mfg. Co., Muskegon Heights, Mich. Joining Morton in 1935, he later became a design engineer of special machine tools. In 1951 he was transferred to the engineering department, serving as sales engineer prior to his appointment as sales manager. *Oakley B. Mitchell* has been appointed purchasing agent. He was previously assistant purchasing agent.

Kreifeldt

Died . . .

L. A. Davis, vice-president and district sales manager since 1945 of the Stulz-Sickles Co., Newark, N. J., died recently. He was 56. Prior to his association with Stulz-Sickles, he was active in the reclamation welding industry and was also a welding distributor for the firm. Mr. Davis was a member of the American Welding Society.

Harry C. Boardman, director of research, Chicago Bridge & Iron Co., Chicago, died August 6, in Chicago. He became associated with Chicago Bridge & Iron Co. in 1910, leaving in 1916 to return permanently in 1926. Since 1954 Mr. Boardman had been chairman of the boiler and pressure vessel code committee of the American Society of Mechanical Engineers. He served as past president (1939) of the American Welding Society and past chairman (1950) of the Welding Research Council. He was active in numerous associations. He is survived by his wife, Bessie, three sisters and a brother.

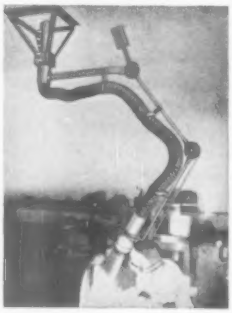
Boardman

Weld-O-Vent

"World's Finest Exhaust Systems"

Welding Fume Exhausters

MANY EXCLUSIVE FEATURES



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- Portable and stationary units for all applications.
- Unlimited flexibility, fast, easy positioning, over 360° radius.
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- Units can be connected in series.

Available in 9, 12, or 16 feet reach units.

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Make More Money on EVERY Welding Job . .

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SOLDERING AND WELDING
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- Make your own test—also send for our pocket-size catalog which contains information and descriptions of our money-saving METAL BOND Products.

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Made Easy With
"Visuweld" Torches

VISUWELD torches improve and simplify tig welding by giving faster and better welds with less effort and minimum torch maintenance.

- The lightest and smallest 350 amp TIG welding torch with super maneuverability.
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30 YEARS AGO

(Taken from *The Welding Engineer* of September, 1926)

The National Oxygen Co., Chicago, recently opened a downtown office at 29 S. LaSalle St. in that city.

—30 YEARS AGO—

Acme Oxygen Co., East Chicago, Ind., plans to construct a new plant at 142nd and Forsythe Ave. in East Chicago.

—30 YEARS AGO—

The Detroit office of the Purox Co. has moved from 620 E. Hancock Ave. to 5443 Twelfth St. Larger quarters at the new address will provide space for large stocks and also a display room and demonstration area.

—30 YEARS AGO—

Burke Electric Co., Erie, Pa., manufacturer of welding equipment, generators and motors, has appointed E. I. Van Doren of Troy, N. Y., a district sales agent.

—30 YEARS AGO—

The new plant of Reid-Avery Co., Baltimore, has begun full operation. With the addition of this plant the firm is able to control every step in the manufacture of welding rods and electrodes.

—30 YEARS AGO—

Thompson Electric Welding Co. of Lynn, Mass., will construct a new one story manufacturing plant in the near future.

—30 YEARS AGO—

A feature article discusses the substitution of welded pipe lines for the former system of screwpipe in concrete paving projects of the state of California.

—30 YEARS AGO—

Roy Thomas, Los Angeles welding supplier, assures himself of return business, states an article, because all gages supplied by his firm have a business card pasted on the gage front. When a breakdown occurs the operator cannot help noticing the card.

—30 YEARS AGO—

A monster cast-iron flame-cutting project was recently completed for Packard Motor Car Co. by Weldit Acetylene Co., Detroit. D. L. Hart did the actual cutting of several huge counter balancing weights, reducing the size of the 1,000 lb pieces.

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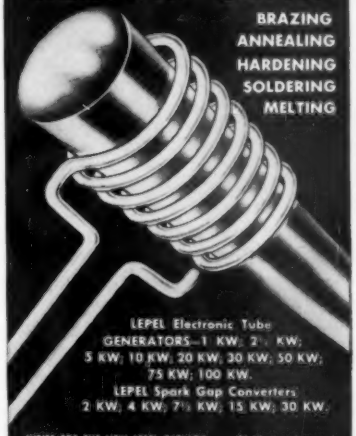

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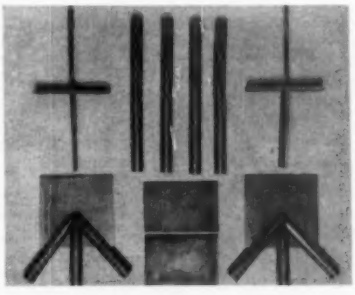

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51. WELDING, CUTTING — Dockson Corp. 4-page color, illustrated bulletin (Form 56-05) describes available welding and cutting equipment: regulators, cutting torches, hose connections, hose clamps, welding goggles.

52. WELDING GUIDE—Eutectic Welding Alloys Corp. 140-page pocket-size welding data book (TIS 2575) features simplified welding procedures for base metals. A guide to improved torch and metal arc welding, brazing, booklet contains useful how-to-weld information for fabrication, maintenance repair, etc.

53. RW FLASH WELDING—The Taylor—Winfield Corp. Bulletin SP-15 describes resistance flash welding of components for aircraft and similar applications.

54. METALLIZING—Vandersee Corp. 4-page illustrated booklet describes metallizing with the "Vanco" metallizing gun.

55. RESISTANCE WELDING—Weldaloy Products Co. 56-page illustrated catalog No. 56 describes, with specifications, resistance welding products, accessories and materials. Included are electrodes, holders, special alloys.

56. WELD INSPECTION — American Cystoscope Makers, Inc. 32-page catalog describes and illustrates visual inspection with the borescope, a precision optical instrument. Catalog gives uses, construction and types of borescopes.

57. CUTTING TORCHES—Smith Welding Equipment Corp. 40-page catalog No. 756 covers complete line of torches and equipment for flame-cutting, heating, welding and brazing. Amply illustrated.

58. BRONZE ELECTRODE—Ampco Metal, Inc. 4-page illustrated bulletin W-25a describes characteristics, properties and sizes of five grades of "Ampco-Trode" electrodes, both a-c and d-c, with typical applications.

59. CAST IRON WELDING—The International Nickel Co., Inc. 12-page booklet offers guide to cast-iron welding. Tips on production welding and welding heavy sections included.

60. GROUND CLAMPS — Wagner Mfg. Co., Inc. Catalog sheet illustrates and describes different models of ground clamps, with details on specific uses.

61. HOSE COUPLING—Titeflex, Inc. 20-page booklet (illustrated) discusses hose couplings designed to handle gases, liquids, chemicals. Specifications included.

62. MANIPULATOR—Worthington Corp. 4-page bulletin R-1700-B18 on automatic welding head manipulator, mast type, includes specifications, general description, special features.

63. BARREL FINISHING—Oakite Products, Inc. Illustrated folder "Precision Barrel Finishing" describes barrel finishing methods and materials from precleaning to final rinse.

64. RECTIFIERS — Hanson-Van Winkle-Munning Co. Bulletin ER-108 illustrates and discusses construction and uses of selenium and germanium rectifiers.

65. GRINDING WHEELS — Robertson Mfg. Co. 4-page bulletin (E-149-56) discusses, with illustrations, carbide grinding wheels.

66. OXIDATION REMOVER—Janco. Illustrated folder describes "Pelox," a neutral, inorganic chemical compound for removing and preventing oxidation on stainless steel and, in welding repair shops, for cleaning and polishing welding equipment. It is also said to provide faster cleaning of welded seams.

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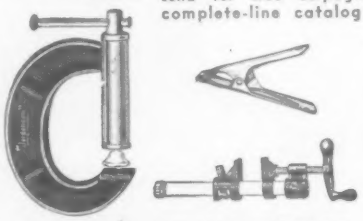

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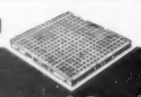

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125. Adjustable Clamp Co.—Catalog on two kinds of welding clamps.

126. Airline Welding & Engineering—Data and samples on fusion butt welds.

127. Air Reduction Sales Co.—Catalog 1318-WE, "Airco Electrode Guide," on selecting the right electrode for your specific job and technical and metallurgical information on "Aircomatic" welding wires.

129. Air Reduction Sales Co.—Catalog 1318-WE "Electrode Pocket Guide," contains descriptions, applications and procedures, charts and graphs, for using complete line of electrodes.

130. Air Reduction Sales Co.—Catalog 9-WE on rods and fluxes for joining both ferrous and non-ferrous metals

131. Allen Co., Inc., L. B.—Information on fluxes for soldering, brazing, and welding plus free test sample.

132. Alloy Rods Co.—Complete information on "Atom Arc 7016" iron-powder, low-hydrogen electrodes.

133. All-State Welding Alloys Co., Inc.—Wall chart and "Buyers Guide" on alloys and fluxes for welding, brazing, soldering, tinning and cutting.

134. Aluminum Co. of America—Information on aluminum welding, brazing and soldering.

135. American Brass Co.—Information to help you in selecting welding rods.

136. American Manganese Steel Div.—Data on "Amsco" "Wear-Sharp" and "Cast-to-Shape" repointers for rebuilding worn out teeth.

137. American Platinum Works, Inc.—Complete reference manuals, "A Complete Guide To Selective Fluxing For Low-Temperature Silver Brazing," and "A Complete Guide To Successful Silver Brazing . . . Silvaloy," on low-temperature silver brazing and fluxing.

138. Ampco Metal, Inc.—Details on longer life of five grades of "Ampco-Trode" electrodes.

139. Anti-Borax Compound Co., Inc.—Descriptive circular and sample of solder and brazing compounds and fluxes.

140. Arcair Co.—Details on reducing maintenance costs and "Case History Book," on Arcair torch's performance in countless industries.

141. Arcos Corp.—Free performance test and demonstration of new "Aerocor" and "Fabricor" d-c welding electrodes.

142. Aro Spot Welder Div.—Illustrated literature on portable spot welders.

143. Atlas Welding Accessories Co.—Details on weld-cleaning tools and other accessories.

144. Belden Mfg. Co.—Details on magnet wire and welding cable.

145. Burdett Oxygen Co.—Catalog on "Burdox" supplies for welding, cutting and safety equipment.

146. Carborundum Co.—Folder A-1298 gives applications and recommendations on fiber-reinforced, resin-bond "Carboflex Cut-Off-Wheels."

147. CBC Industries, Inc.—Information on weldor's qualification test kit.

148. Chicago Eye Shield Co.—Complete catalog on welding helmets and other safety products and name of nearest "Cesco" distributor.

149. Contour Marker Corp.—Information and instruction book on laying out pipe joints and establishing and marking a point at any angle.

151. Coyne Cylinder Co.—Specification sheet and price list on acetylene cylinders.

152. Cratex Mfg. Co.—Illustrated catalog shows wide range of sizes, application details and prices on rubberized abrasives for burring, smoothing and polishing operations and details on polishing kit.

153. Cullen-Friestedt Co.—Bulletin WP26 details specific advantages of "C-F" positioners.

154. Detroit Testing Machine Co.—Catalog sheet and price on portable tensile tester for testing strip steel, wire bolts, spot welds, etc., within its 4,000 lb. capacity.

155. Dockson Corp.—Details on brazing, heating, cutting and welding outfits.

156. Drawalloy Corp.—Information on precision-drawn hardfacing and welding wire.

157. Engwald Corp.— Application data on welding-fume exhausters.

158. Erico Products, Inc.—Booklet 5MB on "Caddy" arc welding accessories with the "Cadweld" connection.

200. Eutectic Welding Alloys Co.—Pocket guide, "Welding Data Book," on stronger, faster welding.

159. General Cable Corp.—Details on how aluminum welding cable makes your job easier.

160. General Electric Co.—Descriptive Bulletin GEC-1305 on how 295-amp a-c welders can do big-welder jobs.

161. General Electric Co.—Descriptive bulletin on how engine-driven welders can help you.

162. Goldsmith Bros. Smelting & Refining Co.—"GB Data Book" gives complete information on low-temperature silver-brazing.

163. Grayson Tool Co.—Details on how "Universal Positioner" clamps hold in any position for soldering, welding, assembling, regulating and painting.

164. H & M Pipe Beveling Machine Co.—Detailed information on "Model O" pipe beveler.

165. Harnischfeger Corp.—"Free Load-Capacity Table" covering the "P&H" positioner line.

166. Harnischfeger Corp.—Information on "P&H" a-c/d-c welder combination with "Dial-lectric" control.

167. Harris Calorific Co.—Details on faster cutting speeds with the new automatic system.

168. Haynes Stellite Co. — Booklet, "Haynes Alloys Hardfacing Manual," gives information on complete line.

169. Hobart Bros. Co.—Information on a-c/d-c welder combination, a-c/d-c welder combination with inert gas controls, d-c rectifier welder and catalog on various types of manual arc welders.

173. Hobart Bros. Co.—Complete information on automatic welding with constant voltage and simplified controls.

174. Holger-Andreasen, Inc.—Information on "Andrex" portable X-ray for fast non-destructive inspection of welded metal structures.

175. International Nickel Co., Inc.—"A Handy Guide to Welding Cast Irons" is

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176. Invincible Vacuum Cleaner Mfg. Co.—Folder on all types of flux recovery systems.

177. Jackson Products, Inc.—Details on interchangeable lens holders, headgears, arc welding helmets and electrode holders, ground clamps and cable fittings.

178. K-G Equipment Co., Inc.—Details on "AP" combination welding and cutting outfit, single or two-stage regulators and accessories.

179. Kedman Co.—Information on welding helmets, face shields and accessories.

180. Lenco, Inc.—"Hi-Amp Messenger" gives all the facts about "Hi-Amp" products.

181. Lepel High Frequency Labs., Inc.—Catalog contains information on high-frequency induction heating units for brazing, annealing, hardening, soldering and melting.

182. Lincoln Electric Co.—Bulletin SB-1351 gives specifications and procedures on E-6013 electrodes made especially for sheet metal.

183. Linde Air Products Co.—Information on high speed flame-hardening machine.

184. Linde Air Products Co.—Information on "Oxweld CM-45" portable machine carriage and how "Purox C-205" torch handles straight-line cutting, bevel-cutting and circle-cutting.

185. Mallory & Co., Inc., P. R.—Reference book, "Resistance Welding Catalog," lists straight electrodes, holders, seam welding wheels, dies, forgings and castings.

186. Metal & Thermit Corp.—Descriptive literature on "Murex Speedex-U" iron-powder E6013 electrodes.

187. Metal Bond Mfg. Co.—Catalog on soldering and welding products.

188. Metallizing Engineering Co.—Bulletin 127 on ceramic coatings.

189. Metallizing Engineering Co.—Bulletin 126 on hardfacing.

190. Miller Electric Mfg. Co., Inc.—Details on selenium-rectifier type d-c arc welders.

191. Miller Electric Mfg. Co., Inc.—Details on "AEA-200-L" power plant.

192. National Carbide Co.—Write for name and address of nearest supplier.

193. National Cylinder Gas Co.—Illustrated Bulletin NH-136 on "Sureweld" semiautomatic welding equipment and the new "DRCV" constant voltage welder.

194. National Welding Equipment Co.—Booklet, "You don't need an egg beater to mix gases."

195. Norris-Thermador Corp.—Specification on all sizes of acetylene cylinders.

196. Page Steel & Wire Div.—Folder DH-402A on submerged-arc and inert-gas welding wire.

197. Pandjiris Weldment Co.—Catalog 815 on manipulators, positioners, "weldevators," seamers, head and tail stocks and turning rolls.

198. Picker X-Ray Corp.—Complete information on everything in radiography and fluoroscopy.

199. Progressive Welder Sales Co.—Data on how advanced design of new press welder makes faster, easier, more economical spot or projection welds.

201. Resistance Welder Corp.—Data on complete line of standard spot, projection, seam and flash-butt welders and complete automated production lines.

202. Sellstrom Mfg. Co.—General Catalog No. 33 on safety equipment and details and sample of No. 372 "Dependon" shield.

203. Smith Corp., A. O.—Information on E6016 low-hydrogen electrodes.

204. Smith Corp., A. O.—Complete details on welder-proved electrodes, machines and accessories.

205. Smith & Sons, Inc., G. W.—Data on how "Protect-O-Metal" spatter-proofing compounds make weld cleaning easier and improves your welds at the same time.

206. Smith Welding Equipment Corp.—Information on "Silver Star" cutting torch which is for fast cutting at low pressures.

207. Square D Co.—"Proximity Limit Switch Bulletin," on new switch that operates without physical contact.

208. Stulz-Sickles Co.—Money saving "how-to-do-it" details on rebuilding worn gyratory, roll and jaw crushers with "Manganal" round applicator bars.

209. Sylvania Electric Products, Inc.—Information on new color coded tungsten electrodes for quick identification, safety and economy.

210. Taylor-Winfield Corp.—Brochures on recommended welding techniques for basic types of resistance welding, catalogs on field-proven standard and special welders and laboratory reports on production analysis experiments.

213. Tec Torch Co., Inc.—Leaflet on transparent gas cups for Tig torches.

214. Tempil Corp.—Information on, and sample pellets of, temperature indicators.

215. Tillman & Co., John—Catalog on weldors' gloves and garments.

216. United States Steel Corp.—Details on how versatile USS "T-1" steel can help your operation.

217. United Wire & Supply Corp.—Information on "Phoson" brazing alloys.

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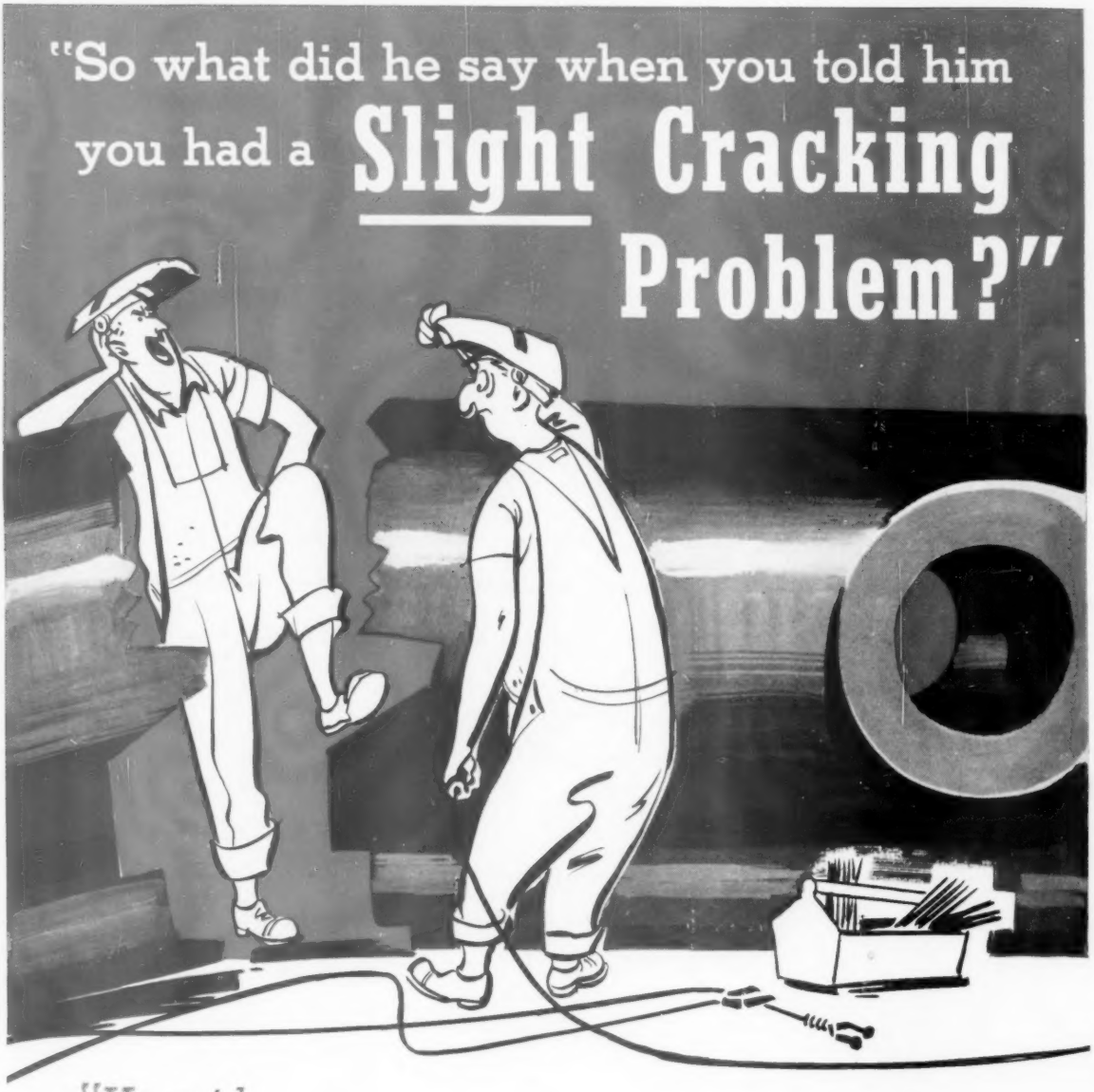

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